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Vol. VII. NEW YORK, JANUARY 9, 1886. No. 2.

CHICAGO'S big group of electric lights, visible sixty miles away, is creditable to that great metropolis of the West, and gives us further assurance that she will never permit her light to be hidden under a bushel—not even a bushel of wheat.

THE establishment of a national electrical laboratory is now being agitated in England, where the lack of uniformity is felt more and more. The opinion seems to be universal that an electrical standard bureau is needed, and we would gladly see our government establish one here also.

IN another column we print a letter which Mr. Heinrichs has addressed to the Franklin Institute, and wherein he gives his specific reasons for doubting the accuracy of the recent dynamo tests. He relies principally upon precedent and calculated values for his support.

WITH this issue is given a four-page supplement containing an index for the past year of all the important articles that have appeared in the paper during that time. The value and variety of the contents of THE ELECTRICAL WORLD may be inferred from the fact that even when condensed, the index occupies so much space.

MR. JAY GOULD failed signally last year in his efforts to obtain a monopoly of the telegraph service of Canada, and the prospects of a vigorous opposition to the prevailing Western Union influence are growing daily. But the long-talked-of cable to connect the Canadian Pacific system of telegraph with Australia, China and Japan is still unrealized.

THE quick wit of those operators who saved the life of the lady who had taken poison, by telegraphing remedial measures in the absence of a doctor, emphasizes the value of the telegraph and the great advantages of the telephone in private houses. A telephone at home would not only expedite medical treatment when time is most precious, but it would also, in many cases, save the doctor needless exposure at night.

THE story from New Orleans that an Italian organ grinder, weary of his wicked pursuit, laid down his instrument of torture and leaned against an electric light post and was instantly killed, is hard to credit, more so since the same report says that the current had not been turned on the circuit. It is only a few days since that an infuriated Philadelphian shot an organ-grinder whose music rasped his soul, and it may be that this "accident" blamed so glibly on the electric light current is the work of some unseen avenger.

THE use of globes on arc lamps to prevent sparks from igniting surrounding inflammable material can avail nothing if careless trimmers be employed. In a recent case a large cotton-shed caught fire from a red-hot carbon thrown among a pile of loose cotton. Fortunately it was discovered before much damage was done, and the lesson taught is simple. It also suggests that the large quantities of carbon stumps usually thrown away as worthless might be gathered, and sufficient accumulations resold to the carbon manufacturers, to be reworked. The new carbons would be considerably improved by this infusion of *old* blood.

THE story that comes now from Philadelphia about a number of wires and linemen at work thereon forming a vast silhouette of a clef of a musical score, and a pianist being able to play a part of the tune from the "notes" thus curiously formed, has the merit of being something new in a business which is growing very dull. In view of the fact that the linemen have just finished cutting and carting off the wires of the American District Company there, it is no wonder that a picture of them should yield a ditty like "How Paddy Stole the Rope." Another view by the same artist might yield us "How Mickey Sawed the Pole," and in this way the camera may result in "exposures" that are not altogether photographic.

LAST month United States Senators Edmunds and Cullom both introduced bills which recognize the equity of purchasing the existing telegraph lines instead of establishing Government competition to destroy private rights. Either of these bills would allow the Western Union (bought on a basis of 5 per cent. per annum earnings) $100,000,000 for its plant, and as the Cullom bill provides that the payment shall be in "thirty-year three per cent. bonds" there can be but little doubt that Jay Gould would sell for a hundred million dollars at three per cent., Government bonds being a great profit on the watered stock. The Cullom plan which we gave last week would, whatever the intentions of its originator, benefit Western Union alone.

THE developments of the last few days allow of the assertion, with considerable confidence, that, so far as Broadway in this city is concerned, the placing of the wires underground will in the near future become an established fact. Our description of the plan adopted by the New York District Railway Company shows a matured undertaking, and it would be difficult to conceive of a more feasible plan under existing circumstances. The electric railway, which will undoubtedly be employed, will make travel a pleasure rather than an inconvenience, and with the cars brilliantly lighted by electricity, daylight will not be missed and fresh air will not be tainted. The names of the men at the head of this enterprise furnish sufficient guarantee that the design will be carried out in a substantial manner, worthy of such a vast and meritorious plan.

ONE of the most notable signs of the times regarding power developed from electricity is the great impetus which has been given to ballooning since the discovery of the reversibility of the dynamo and the storage battery. Following the successful experiments of Messrs. Renard and Krebs in France, we now notice the latest device of General Thayer, of our own army, who seeks to construct a balloon way, consisting of two wires, which act both as guides for the balloon, and as conductors of electricity required by the motor. There is nothing visionary in this project, and for war purposes or the development and establishment of communication in new countries, the system appears quite feasible. The balloon needs only a suitable power to make it a perfect success, and electricity seems better adapted than any other to the purpose.

PATENT suits absorb the attention of English courts as well as our own, and just now one of considerable interest is threading its slow way through weeks of examination. The bone of contention is the gas engine, Dr. Otto, of the "Otto silent," having sued another gas engine builder for infringement. The point at issue is the method by which the silence of the explosion is obtained. Dr. Otto claims that by the construction of his engine the gases, explosive and non-explosive, are in a so-called stratified condition, there being as it were a cushion of comparatively incombustible gas between the piston that works the engine and the part of the gas where the first part of the explosion takes place; and hence the silent explosion. On the other hand, it is contended that this stratification does not take place and that the gases become thoroughly mixed upon entering the cylinder. As is usual in such cases expert testimony in support of both sides is not wanting. The outcome of the suit, which has not yet been decided, will, no doubt, be watched with interest in America.

OUR usually bright and well-informed contemporary, the *Mechanical Engineer*, in a recent article commenting on electric railways, makes the following rather curious statement: "Take away the steam-engine and the railroad is inoperative, by electricity or anything else. As there is always a loss in transferring power from the source of it to an agent, the use of electricity on railroads is impracticable, and will be unprofitable, until it can be produced independent of steam." It would be interesting to know upon what assumptions regarding the convertibility of forces this statement is based. So far from operating electric railways without steam, the employment of the latter has never for a moment been lost sight of, and has entered into most calculations relating to the subject, as our columns have often borne witness. For the benefit of our contemporary, we will remark that while a good compound condensing steam-engine can deliver one horse-power per hour, with a consumption of 2½ pounds of coal and less, the locomotive requires anywhere from 7 pounds and over for the same power. And this is only one item in the case, of which a number could be cited in favor of electricity over steam *direct*. Allowing even considerable loss of efficiency on account of the transformation from one power to another, it will be seen that a large margin is left in the one item of coal consumption alone.

IN a recent pamphlet addressed to scientists and inventors, the author, Mr. Lysander Spooner, undertakes to show that all of them ought to have a *perpetual* right to their discoveries and inventions, and that our laws granting patent protection for only a limited time are relics of barbarism. Starting out with the proposition that knowledge is property, he argues "that in truth and justice scientists and inventors have the same right to *perpetual* property in the products of their brain labor that other men have in the products of their hand labor;" and "that it is the right, and for the interests, of all past discoverers and inventors, and their heirs, to recover their natural right of perpetual property in their discoveries and inventions." While this would be a most convenient arrangement for inventors and scientists, we fail to see the justice of it in relation to mankind at large. According to Mr. Spooner, every scientist who discovers a *law of nature* should have the sole right to application of the law for all time. Now, it is a well-known fact that scientists who discover laws rarely have the genius to apply them for the benefit of mankind; indeed, that others usually step in and create inventions based upon the laws. Hence, if Mr. Spooner's idea prevailed, a *law* would in all probability remain without practical application for all time. But assuming that the scientist did apply his *law* in one way, might not the same thing be accomplished in another and better manner *by other means* based upon the same law? Yet upon Mr. Spooner's theory, that new inventor would be entirely at the mercy of the original discoverer of the law. We may safely assert that no true scientist would care to have a law, discovered by him, exploited to his own personal use forever; in fact, the idea is absurd, and would bring all invention to a standstill. Looked at from the inventor's stand-point, the right of perpetual property would put a block in the way of improvements which we think is too evident to need demonstration. Let us take an extreme case, and suppose that all discoverers of whatever nature—and Mr. Spooner includes them—were to have a perpetual right to their discoveries. Surely Columbus and his heirs would have a good claim to this continent, and if this is Mr. Spooner's idea of justice to mankind, it is very far-fetched. Mr. Spooner seems to think, also, that inventive genius is stifled by the limiting patent, but statistics show that, on the contrary, invention is on the rapid increase. His idea of a universal protective system for inventions, however, is a good one, and would be highly desirable. We have put our views rather strongly, because we do not wish to see the real claims of inventors to justice imperiled by an extreme enunciation of their rights. We would like to see Mr. Spooner's trenchant and profound pamphlet in the hands of all interested in this highly important subject of patent law and equity.

Telegraphy and the Press.

Mr. Somerville, who has charge of the press service of the Western Union Telegraph Company, has recently given some instructive figures as to the growth of that business, and the changes that have resulted from competition in the rates charged for the service. The total amount of press telegrams, including the Associated Press service, sent over their wires now reach a thousand million words a year. The telegraph year for the transaction of business closes on July 30. In 1879, for the year, there were transmitted of special messages 32,000,000 words; in 1880, 55,000,000; in 1884, 112,000,000; in 1885, 120,000,000. The steady growth of the special service shows the degree to which the leading newspapers are coming to rely on gathering their own news. There has been a great change in the rates for service. In 1879 the average was $1.87 per hundred words; now it is 57 cents per hundred. In England, where distances are short, the average rate on special dispatches is half a cent a word. The Associated Press is carried at an average of fourteen cents per hundred words for each place. In England the rate is twenty-five cents, with an extra charge for certain advantages, which brings it up to twenty-seven cents. When Mr. Somerville took charge of this branch of service in 1879, the rate to the Pacific Coast was ten cents per word; now it is one and three-quarter cents to San Francisco, and only two cents to the farthest point on the coast. This is the highest rate anywhere made. Similar changes have been made in the rates between other points, in some instances due to competition. The old Chicago rate was three cents from New York; now it is half a cent. Washington was one cent, and is now one-fourth of a cent. A great many papers lease special wires by the year. The Western papers take large quantities of matter nightly from New York. The figures given relate only to the service over the Western Union wires. The other telegraph lines of the country carry about one-third as much more.

A Triangular Telegraph Fight

Last summer before United States Judge Shipman, at Hartford, in the case of the Boston Safe Deposit Company against the American Rapid Telegraph Company, an order based on an express stipulation between all the parties except two was obtained, commanding President Edward S. Stokes, of the United Lines; Mr. Farnsworth, the receiver of the Bankers and Merchants' in New York State, and James G. Smith and Richard S. Newcomb, the Ohio receivers of the same company, to turn over to the Western Union, as agent for General Harland, receiver of the American Rapid, all property in their possession or under their control and belonging to the last named corporation. The property in question, despite this mandate, has been withheld in the face of repeated demands for its transfer, and the men named appeared at Syracuse, N. Y., Dec. 31, before Judge Wallace to answer to an order to show cause why they should not be punished for contempt in refusing to obey. Ex-Senator Conkling, Colonel Robert G. Ingersoll and Edwin Lauterbach appeared for the United Lines; Henry J. Schenck for Receiver Farnsworth; Angel J. Simpson for Receivers Newcomb and Smith; Joseph Choate and William G. Wilson for Receiver Harland, and ex-Judge John F. Dillon, A. J. Vanderpoel, and Melville Eggleston for the Western Union. The case involved the past and present relations of all the interested companies, and was so complicated that even Judge Wallace had to admit, when the hearing was over, that he had not been able to follow it through its manifold ramifications, and that he would require the different parties concerned to furnish him with a brief statement of the most important facts in chronological order.

Mr. Nelson opened the case, dwelling at length upon the previous relations between complainants and defendants, and reciting all the facts which had led to the present proceedings. He laid great stress on the contract which the Bankers and Merchants' had made in 1883 with the American Rapid, and whereby it had undertaken to construct for the latter company two circuits, one running from Cleveland to Chicago, and the other from Pittsburgh to St. Louis. Colonel Ingersoll admitted the Hartford stipulation, but said that he had made honest efforts to fulfill his agreement, and would have secured compliance with the Shipman mandate had he not been prevented from carrying it out by courts in Ohio and Illinois. He denied that there had been any willful disobedience. Mr. Conkling said that no legal service had been made, and the motion in contempt was therefore irregular. Argument for Receiver Harland was made by Mr. Choate. He began with an arraignment of the defendants for refusing to deliver the account books and papers, which, he said, were vouchers for money paid out by and in the name of the American Rapid Company, and belonged without question to that company's receiver. He took the ground that Receiver Harland and the Western Union have not performed their part of the Hartford stipulation, and were therefore in contempt themselves. He contended that there was nothing in the moving papers to show default on the part of his client or any of the defendants, and defied the opposing counsel to show where, how and when the demand had been made and refused. Judge Dillon made the closing argument, his particular contention being that the Bankers and Merchants' in its relation with the American Rapid were mere contractors, and had never acquired any proprietary interest in the lines constructed for that company.

Judge Wallace ordered the affidavits in the case to be submitted to him in print within five days.

A New Selenium Cable Recorder.

The currents employed in submarine telegraphy are so minute that the method first employed in receiving messages was that of the deflections of a very delicate mirror galvanometer. Later Sir Wm. Thomson introduced his siphon recorder, which leaves a permanent record, consist-

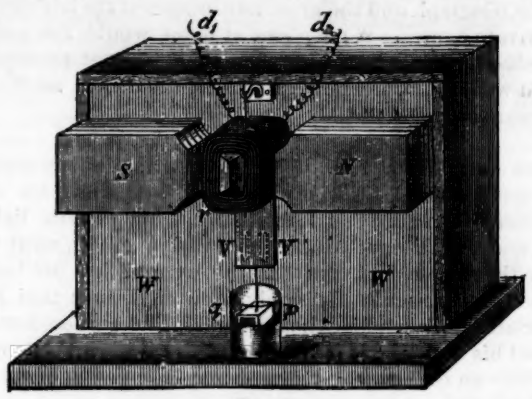


FIG. 1.

ing of a continuous curve of varying amplitude, the reading of which, however, requires considerable practice. With the idea of obviating this difficulty, Eugene Baron of Taund-Szyll, Germany, has recently devised a form of recorder in which the record is considerably simplified, and approaches more nearly to the Morse characters. He accomplishes this by employing a selenium cell, the variations in resistance of which call a relay into action which closes a local circuit and causes the characters to be

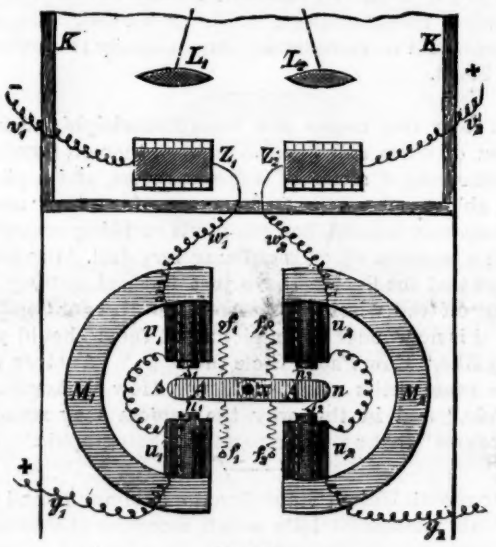


FIG. 2.

plainly recorded. The closing of the relay is not effected mechanically but *optically* by the varying illumination of the selenium cell. In practice there are two selenium cells in connection with two local circuits, and the recording apparatus is actuated by the differential action of both local currents; hence the apparatus has been called by the inventor a Selenium Differential Recorder.

Broadly stated, the deflecting coil of the ordinary siphon recorder is made to change the position of a light screen,

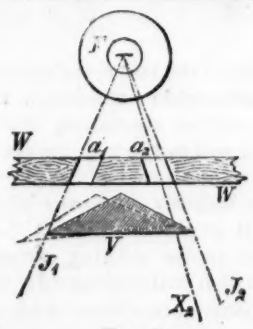


FIG. 3.

which, moving before two small slits, admits light to and shuts it off from two selenium cells, which then act in the manner described above.

The accompanying illustrations, taken from the *Elektrot Zeitsch*, show the details of the apparatus. The box *K*, Figs. 1 and 2, is divided into two compartments, the first of which contains the electro-magnetic part of the relay and the selenium cells. This disposition is not essential, however, as they can be removed to any desirable place, and the recording apparatus proper need only be in the operating room.

The second compartment contains a bright source of light, such as an incandescent lamp *F*, Fig. 3. The dividing wall between the two, *W*, has two slits, through which the light enters when permitted to by the screen *V*.

The relay consists, as stated above, of the siphon recorder coil *r*, placed in the magnetic field of the magnets *N*, *S*, and deflected in either direction according to the direction of the currents in the cable. The coil carries a downward projection in the shape of a triangular prism *V*, Figs. 1 and 3. When the latter is in its central position it covers both slits, a_1 and a_2, and prevents the light from passing either one. A current passing through the coil deflects the latter correspondingly, and with it the triangular screen, which then permits the light to pass in the same side, as shown, in the direction *F J*, Fig. 3. After passing the slits the light is concentrated on the selenium cells Z_1 Z_2, by the lenses L_1 L_2, Fig. 2.

Light falling on the cells reduces their resistance, as is well known, and the two local batteries being in circuit with the cells Z_1 Z_2, the current is varied accordingly. The arrangement of the recording apparatus is shown diagramatically in Fig. 2. M_1 and M_2 are two powerful horseshoe magnets, the poles of like name being diagonally opposite each other. Between the poles of these magnets there is pivoted a bar magnet *A*, supported by the spindle *X*. This polarized armature can be regulated to a central position by the springs f_1, f_2, and the coils u_1, u_2 of very fine wire are included in the local circuits. The poles n_1, s_1 act, the one attractively, the other repulsively upon the armature; s_2, n_2 act similarly. A small difference in the strength of these four poles causes a deflection of the armature. In each local circuit there is, in addition (not shown), a variable resistance, which is provided for the purpose of equalizing the resistances of the circuits, as the selenium cells are not always of equal resistance.

It is apparent that as light is admitted to either cells the armature will be deflected in one direction or the other, and the armature can be made to record these movements either directly, or through the medium of another recording apparatus, by the closing of an auxiliary local circuit.

In order to prevent too great an oscillation of the coil *r*, in Fig. 1, a damper is attached to it, which consists of a plate dipping into a beaker of glycerine and water. This prevents the coil from passing the centre on its return stroke, and thus obviates false signals in the recording apparatus.

The Schuyler System South.

A Schuyler plant is now in operation at Knoxville. The local company is composed of men of wealth and high standing in the community, and a large number of lights have already been subscribed for. The *Chronicle* newspaper is using the light and speaks highly of it, adding that the people generally like its quality and quantity. The Louisville *Times* says: Last night, for the first time, the city of Knoxville was lighted by electricity. Gay street was brilliantly illuminated and many of the leading business houses were lighted by electricity. The light gives perfect satisfaction on the first trial, which is something remarkable in the history of electric lighting. The light is steady and constant, and very powerful. One lamp to each square is sufficient to make the street almost as light as day, and one lamp in a business house lights it up with dazzling brilliancy. For several months the Knoxville Schuyler Electric Light Company has been engaged in locating a plant in that city. Work has progressed rather slowly. This is partly due to the change of plan. It was at first intended to put down a forty-light plant, but before work had progressed far the enterprise met with such hearty encouragement from the citizens of Knoxville that the company felt justified in putting in a plant for 120 lights. The location secured for the engines, boilers, dynamos and other machinery and equipments is 88 Gay street. The first floor is occupied by the dynamos and all the apparatus by which the electrical currents, etc., are regulated. The engines are in the basement, which has been substantially fitted up, and the immense boilers are in a large boiler house in the rear of the main building. Everything is on a substantial and extensive scale, and the Schuyler electric light has evidently come to stay.

An Open Letter on the Franklin Institute Tests.

To the President and the Board of Managers of the Franklin Institute of the State of Pennsylvania.

GENTLEMEN: I have pointed out in my letter to THE ELECTRICAL WORLD of the 19th ultimo, of which I forward you a copy, that the efficiencies given by your committee to the Edison and Weston dynamos are most probably too high.

The seriousness of this statement is too obvious to be passed over without due consideration. The public at large, the capitalist and the inventors individually are interested to know the true efficiency of the dynamos tested by your committee.

A certificate of efficiency, as given in the report published by your authority, will be considered correct; but should it give an undue high efficiency to dynamos owned by the largest companies, it will be detrimental to further progress and will prevent better systems being acknowledged.

Too many fictitious reports made by would-be experts have been given to the public during the last few years by unscrupulous promoters, and have drawn millions out of the confiding public, and there are at present corporations who are working (with their subscribers' money) the most unprofitable systems under worthless or expired patents; but are supported by fictitious statements of efficiency.

All this has produced the present distrust in any, even

the most promising, practically proven and tested invention relating to electrical engineering. Hence, every testimony given by a scientific authority of your eminence ought to be jealously checked and compared with results previously obtained by other authorities, and any material differences found need well be explained.

I have shown, in my letter to THE ELECTRICAL WORLD, the great discrepancies between the horse-power measurements made by your committee and those obtained by other authorities, particularly the values of the horse-power absorbed by the friction of the armatures are given by your committee too small to be accepted at all.

When substituting a more probable figure for the latter items and then calculating the electrical efficiency of the dynamo, it will be found to amount to more than 100 per cent. Thus the conversion of the mechanical energy into electrical would have taken place, not only without loss, but actually with a gain, which is obviously impossible.

All measurements of the electrical energy given out by the dynamos tested by your committee must be accepted as correct, since the values of current, electromotive force and the resistance agree perfectly.

But it is to be regretted that your committee have not compared their horse-power measurements with other results obtained by a former committee appointed by your Institute. The following extracts of tests from Professors Houston and Thomson's tables are contained in the Journal of the Franklin Institute of 1878 :

Name of dynamo tested.	Electrical energy in H. P.	*Approximate weight of armatures in pounds.	Number of revolutions of armature.	H. P. absorbed by friction of armature and resistance of air.
Brush ..	1.6	70	1,340	.54
" ..	1.37	55	1,400	.45
Gramme	1.31	30	800	.137

* Taken from other notes.

Comparing the above values of the friction of the armatures with those obtained by Professor Adams and Messrs. Alabaster, Gatehouse & Co. (given in my letter to THE ELECTRICAL WORLD), it will be noted that they agree with each other and are proportionate; but the values found by your last committee agree with none of the former.

I shall now show that when substituting more probable figures for the items of armature friction the electrical efficiency of the dynamos tested by your committee will be more than 100 per cent.

Table I. of your committee report contains the data of tests of an Edison dynamo No. 5; the item for friction of the armature has been omitted; thus I may take the most probable figure. Prof. Adams found the friction of a much smaller Edison armature to absorb 1.55 horse-power. Accepting this figure, and calculating the electrical efficiency of the Edison dynamo No. 5, the following result will be obtained :

$$\frac{\text{Total electrical energy}}{(\text{Total power applied}) - (\text{power absorbed by friction of armature})} = \frac{18.23}{18.89 - 1.55} = 105.5 \text{ per cent. (!!)}$$

Approximate calculations, made upon a basis given in my letter above referred to, show that the friction of the Edison armature No. 5 absorbs .76 horse-power; though this figure may well be 300 per cent. too small for reasons explained; still, when accepting it, the following electrical efficiency will be obtained :

$$\frac{18.23}{18.89 - .76} = 100.5 \text{ per cent. (!!)}$$

Passing over to Table III. of your committee report, it contains the data of tests of a Weston dynamo No. 7. The friction of the armature is measured, to be from .195 to .311 horse-power, which can be rejected at the first glance. Prof. Adams found the friction of a Weston armature of $\frac{1}{3}$ the capacity to absorb 1.337 horse-power Accepting this figure, the following electrical efficiency will be obtained :

$$\frac{28.47}{28.29 - 1.337} = 102 \text{ per cent. (!!)}$$

Taking, instead of Prof. Adams' figure, only .82 horse-power as being spent on friction of that large armature, *the electrical efficiency would still be* 100 *per cent.* (!!)

Obviously these results are impossible, but show clearly that the whole horse-power measurements made by your committee are erroneous and too small, which explains the enhanced efficiency given to the Edison and Weston dynamos.

Trusting that the whole tests will be reconsidered by you and your committee, and when you have satisfied yourself of the improbability of the results, that the enhanced efficiencies given to the Edison and Weston dynamos be taken off the record,

I am gentlemen, faithfully yours,

NEW YORK, Jan. 4, 1886. CHARLES F. HEINRICHS.

An Excellent Solution of the Underground Wire and Transit Problem in New York.

While discussion and conjecture regarding the disposition of electric wires and railways in this city have been going on many months, there have been at work upon this problem a number of men whose combined efforts have resulted in a plan which cannot fail to commend itself to nearly all concerned, Our readers will remember that in our issue of Aug. 16, 1884, we illustrated Col. Rowland R. Hazard's plan of a "scientific street." This latter is designed to meet all the demands which modern civilization has created, and, so far as New York City is concerned, is the only one which can satisfactorily solve, at one time, both the placing of wires and passenger transportation underground. It is the object of the New York District Railway Company to operate a four track, way and express, subway railway, with electricity as the motive power. It is what New York wants and must have, and it is fortunate that the admirable plans of this road have fallen into the hands of the earnest and competent and wealthy gentlemen who form the body of its corporators.

The simple fact is that a street in a great city ought to be as wholly artificial and architectural as the houses which front upon it, and for the first time in the history of the world the New York District Railway Company will build such a street.

The plans, as now illustrated in the accompanying engravings, embody the thought and experiment of many months, and are those which the New York District Railway Company have adopted for electric "rapid transit."

As will be seen, the whole system is to be built and operated between the curb lines and (except at Canal street above mean high water, for the purpose of avoiding the invasion of the valuable vaults of Broadway, and for the further purpose of compensating existing vested corporation rights without encroaching upon vested private rights or private property.

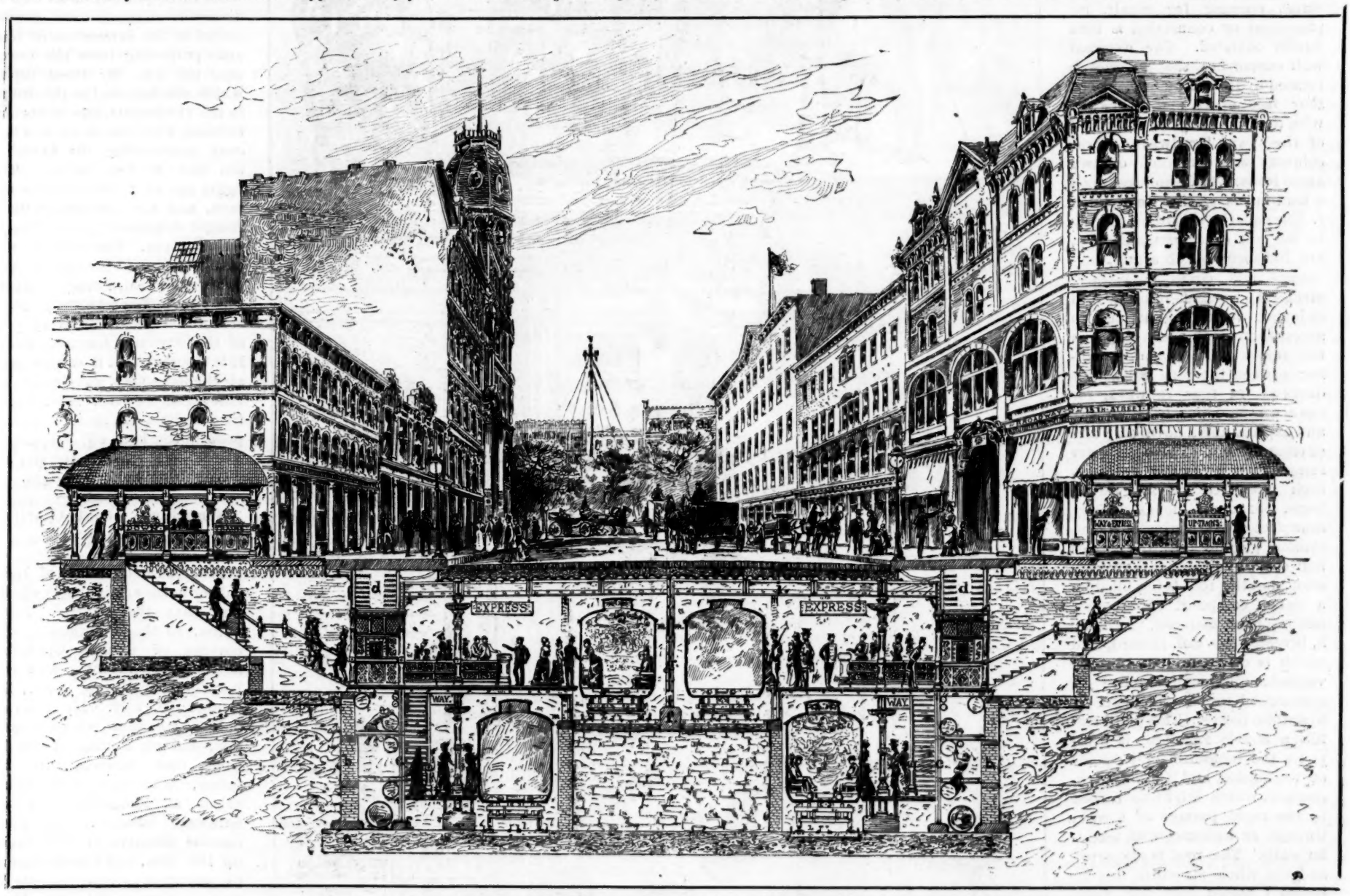


FIG. 1.—NEW YORK DISTRICT RAILWAY—ELECTRIC "RAPID TRANSIT."

The roadway of lower Broadway, between the curbs, furnishes all the accommodation required for every purpose. It is divided into two sections: the one centrally placed affords accommodation for the way and express trains; the section on either side disposes of the existing impedimenta of the street at the point of access to the abutting houses. By this disposition of the streets all requirements are fulfilled. (1.) A smooth, noiseless and unobstructive surface is provided for pedestrian and vehicular traffic. (2.) Express and way trains for through "rapid transit," and for rapid transit from station to station. (3.) Permanent housing for sewer, water, gas, steam, pneumatic and electric conductors and pipes, with access throughout for inspection, and in all cases in immediate contact with the premises where the connections are to be made, In neither express nor way stations is property taken, nor at any point does the structure abut private premises, even during construction.

The method of construction is as follows: Street excavation is effected in sections, and is governed by the extent and character of the traffic, travel being maintained unobstructed by a system of movable bridging. A uniform platform of concrete *a*, about two feet in thickness, floored by a half inch of Trinidad asphalt, extending

across the street at a maximum base depth of about 17 feet, forms a foundation for the whole structure. Upon this is erected the external vault wall *b*, securing to the abutting proprietor the permanent use of the whole vault and area undisturbed throughout the standard section. This vault wall is fitted while under construction with suitable connections for gas, steam, electricity, sewer and water at every house. This wall is also the external wall of the pipe galleries *c*, arranged adjacent to both curbs. The galleries are subdivided longitudinally and continuously, by beams riveted to their internal and inserted in their external walls, which support the sewers and other pipes. Access throughout is provided at the termini and stations, and they are calculated for access to, housing, and inspection of the tubes, pipes and wires. The electrical conductors *d* of the various telegraph, telephone, lighting, burglar alarm, messenger and time companies are arranged anti-inductively, upon shelves riveted to the roof and upper gallery beams. There being no permanent floor above the foundation, the pipes in either gallery are accessible from above or below. Street opening for repair, replacement or connection is thus wholly obviated. The external wall supporting the galleries is formed by iron columns *e*, placed four feet apart, and coincident with those forming the outer wall of the "way" railways. These columns are composed of two angle irons riveted, and rest upon a continuous granite foundation *f*. The galleries contribute largely to the cost of construction, but are indispensable to a safe, convenient and equitable replacement of present impedimenta enjoying vested rights, and to access thereto at every house on the route. The space remaining between the pipe galleries is disposed in four railways, for the accommodation of an up-way and express and a down-way and express train *g*. These ways are formed by five rows of columns, each composed of four angle irons, arranged longitudinally four feet apart, resting on a continuous granite base, the spaces between the columns at the foundation and the roof being filled by a panel composed of a tough, non-resonant material, "ferflax," *h*, invented by Col. Hazard, and which is composed of steel wire, vegetable fibre, and solidified oil compressed into a solid panel by hydraulic power. This panel fulfills a double function; it completes the inclosure for purposes of ventilation, and it prevents resonance, which might be caused by the rapid passage of a train through an inclosure with metallic walls. The roof is supported and the whole structure tied by beams *i* placed four feet from centres which extend across the entire span, bolted at every eight feet to the columns, the ends being inserted in the vault wall. Upon these beams the steel ten-inch span, buckle-plate roof *k* is laid and bolted. Over this is a two-inch skin of Trinidad asphalt as a protector from chemical contact and dampness and as a light cushion. Above this is placed six inches of concrete, which completes the permanent street upon which the pavement will be relaid. The structure as a whole contemplates the minimum of excavation, the maximum of capacity, the greatest number and most equal distribution of points of support and consequent maximum of strength and stiffness in use.

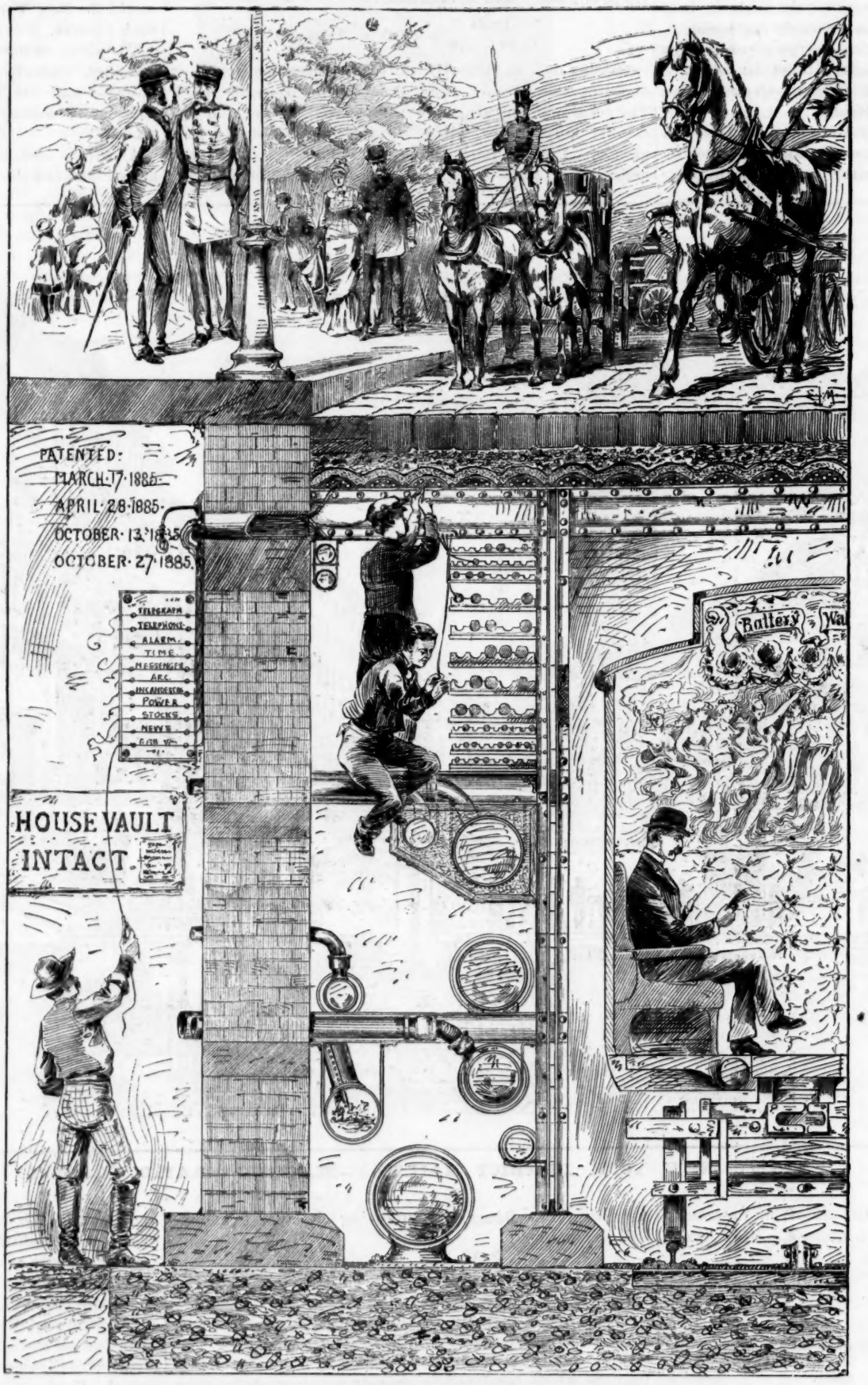


FIG. 2.—NEW YORK DISTRICT RAILWAY.

The railway, as will be noted, will consist of two distinct double tracks, on the same line. The outer tracks are designed for way trains, which will stop at every four or five blocks. The central lines, however, are reserved for express trains, with stations one mile apart, which will allow of obtaining a high speed. At such points the grade of the way train drops below the express, which always keeps the same level, so that no interference between the two is possible.

The electrical conductors for the various services are arranged so that they can be tapped at every house, and special connections are shown therefor. Negotiations have already progressed so far that there can be little doubt that the near future will see the commencement of a work for which New York has been clamoring for thirty years. Electricity will, without doubt, be employed to run and light the trains.

We may add that the construction will proceed without any obstruction to the traffic of the streets, and all new sewers, pipes and wires will be *in situ* before the old are displaced.

The lines of the first section will have three southern termini, one at the Battery, one at Second avenue and Fourteenth street, and one at Ninth avenue and Fourteenth street, and two northern termini; one at Melrose, and one at Central Park, at Fifty-ninth street and Eighth avenue.

The constructive and mechanical details of the system have all been completely worked out, and eminent engineers and constructors have pronounced the plan a perfectly feasible one. We must admit that its ingenuity and its thoroughness win our hearty admiration.

Influence of the Moon on a Magnetized Needle.

M. G. Ligner has made a remarkable communication to the Meteorological Society of Austria. He has ascertained after a number of careful experiments that the moon has an influence upon a magnetized needle varying with its phases and its declination. The phenomenon is said to be more prominently noticeable when our satellite is near the earth, and to be very marked when she is passing from the full to her first and second quarter. The disturbances are at their maximum when the moon is in the plane of the Equator, and are greater during the southern than the northern declination.

Chicago's Crown of Light.

A Chicago special of Dec. 31 has the following: The highest and most powerful group of electric lights in the world is to-night blazing around the tower of the Board of Trade building at the foot of La Salle street, a little over 300 feet above the ground. While the building was in process of construction the idea of crowning its highest point with a ring of lights was suggested by Elmer A. Sperry, a Cornell University man, twenty-five years old, who came here from Cortland, N. Y., three years ago and formed an electric light motor and car brake company. Various circumstances prevented the execution of the scheme until the present time. Mr. Sperry's company put up the lights, the Board of Trade furnished the power and the other expenses are paid by subscriptions from owners of surrounding property, including the Federal Government and several railroad companies. There are twenty of the lights, and they are fastened to a ring of 4-inch gas-pipe 29 feet in diameter. The ring hangs on steel wires three-quarters of an inch in diameter, running over sheaves placed at the extremities of four arms projecting from the tower near the top. By these ropes, which are attached to the drums in the clock-room, the lights are lowered, when necessary, to a balcony surrounding the tower at the dial, 68 feet below. The lights are of 2,000-candle power each, and are connected with a 20-light dynamo of 29 ampères in the basement. The carbons will burn 15 hours if necessary. The lights are to burn every night in the year. To-night the glowing crown is visible from every part of the city and for miles away. It is reported that it can be seen at Michigan City, sixty miles distant across the lake. It is thought that the light can be seen from a point in the lake off Milwaukee. The railroad yards of the city are greatly benefited by the light.

Something About Charles Goodyear.

The enormous value of India rubber in the arts is almost wholly due, says the Chicago *Inter-Ocean*, to the inventions or discoveries of Charles Goodyear, an American inventor, who was born in New Haven, Conn., December 29, 1800. He received only a common school education, and on coming of age he went into business with his father, who was then established at Philadelphia in the hardware business. The commercial disasters of 1830 broke up the firm, and Charles turned his attention to improvements in the manufacture of India rubber. He made experiments in several places for six years without accomplishing any real success. But in 1836 he discovered a process of depriving india rubber of its adhesiveness by dipping it into nitric acid. This process was introduced into use very extensively, especially in the manufacture of rubber shoes. But this process, as its beneficial effects are confined to the surface of the rubber, did not satisfy Goodyear, and he continued his search for a better process. In January, 1839, he observed that rubber mixed with sulphur when brought in contact with a red-hot stove was not melted, and that though deprived of its adhesiveness it remained elastic. Thus was discovered the important method of vulcanizing rubber, *i. e.*, uniting it with sulphur at a high degree of heat. From that time until his death he gave his whole attention to the perfection of the vulcanizing process. In France and Great Britain he was unfairly deprived of his rights, and the infringements of his patents in the United States were numerous; so that Goodyear's profits were small compared to the importance of his inventions. However, he received many medals and distinctions, including the great council medal of the Exhibition of all Nations at London in 1851, the grand medal of honor of the World's Exhibition at Paris in 1855, and the cross of the Legion of Honor presented him by Napoleon III. Goodyear died at New York, July 1, 1860.

On Telephone Systems.*

BY PROF. A. E. DOLBEAR.

(*Concluded.*)

DOLBEAR'S SYSTEM.

No. I. In 1878 I devised what I called a battery transmitter, in which one of the battery plates was so mounted that the sound waves could impinge upon it and cause it to vibrate. In fact, the plate was used for the double function of a battery element and an acoustic diaphram; the other element of the battery, zinc, being thick and rigid. The cell was thin and small, holding but about a tablespoonful of dilute acid. When this cell was spoken to the vibrations of the plate were sufficient to give the proper characteristics to the current which the cell itself provided, and speech was rendered in the ordinary receiver with distinctness nearly "sufficient for every one." I also invented a new receiver combining the attraction of a magnet and the varying friction produced by the varying magnetism. An electro-magnet made with a core which could be rotated on its axis within its coil had resting upon its two poles the two ends of a curved armature, the middle point to which was fastened to the middle of a diaphragm, Fig. 10. When a current of electricity traversed the coil, the magnet attracted the armature, holding it snug against the round sides. When now the core was rotated, the adhesion caused the middle of the plate to be bent in or out, as the turning was one way or the other. If the current varied in

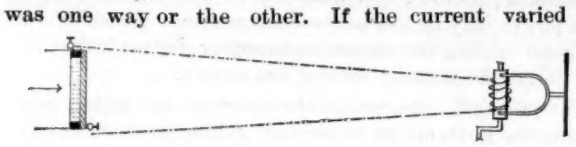


FIG. 10.—DOLBEAR (II.).

strength the magnet varied in strength, the adhesion varied with it and the armature was thrown into vibrations that corresponded with the current changes, and so speech could be rendered with it. In this it is the varying friction caused by magnetic changes which is the cause of the sounds, not magnetic induction as in Reis', or chemical dissociation as in Edison's, while the transmitter had the double function of both battery and transmitter, and therefore in accordance with my methods of distinction I rightfully call this a system.

DOLBEAR'S SYSTEM NO. III.

I once had a receiver so made as to permit a current of electricity to pass between two plates with a few drops of ammonium chloride between them, in the expectation that the decomposition effected by the current would result in gaseous products which would move the plates. I found the result I expected, and had a receiver still different in principle from any I have described, inasmuch as the dissociative chemical relations of the electricity were the immediate cause of the sound vibrations. At one time while experimenting with this the liquid leaked from between the plates, when I found I still heard the talking plainly. This new phenomenon I at once began to work out toward a still better result, until the receiver assumed its present form. For a transmitter I found it necessary to use the high electromotive force which I could only get from an induction coil. Inasmuch as the receiver consisted of two

FIG. 11.—DOLBEAR (III.).

plates as perfectly insulated from each other as it was possible to make them, both by a thin layer of air and by thick varnishing, the resistance was practically infinite, and no current could traverse it, therefore a transmitter, such as could only vary a current which must be maintained, was out of the question. An induction coil is an essential part of the apparatus The complete transmitter consists of the variable resistant transmitter of the plan of Reis, hard carbon being used where Reis used platinum, combined with an induction coil of high resistance 3,000 ohms or more, the terminals of this coil connected with the two plates of the receiver by the ordinary line wire (Fig. 11). The structure of the receiver is such as to constitute it an air condenser, but in addition to that the varnishing upon the plates plays a very important part, an essential part in its commercial working, for it adds to the capacity of the condenser in two ways: 1st, as an ordinary dielectric; and 2d, in its absorptive property, by which it becomes electrified, retaining its charge. It is then like a charged electroscope or electrometer, and is much more sensitive than when the plates are simply metallic and incapable of such electric action. In operation this system is radically different from the others, for, first, it is not operated by a current. The opposed plates are oppositely charged, and therefore attract each other. One of them is free to move slightly towards the other at its middle point, the strength of the attraction determining the amount of movement; but no current traverses the receiver, for its resistance is measured by thousands of megohms, and Ohm's law has no application to it. 2d. The electrical condition of the line is entirely different from that in the other lines, for as no electricity can flow through it, the line itself becomes a charged body, and any electrical changes taking place in it are of the nature of electro-static phenomena. In the magneto telephone the electricity goes uninterruptedly through the coil to the ground beyond. In the static telephone it comes to an impassible barrier and accumulates there; it piles up, so to speak, as the tide does against the shore. The line, therefore, may have its electrical condition likened to an ocean tide and a continuous change of level, while the magneto line may be likened to an unobstructed river with variable quantities of water flowing.

Prof. Cross, who has made measurements of the current strength employed in telephones with various transmitters,

FIG. 12.—DOLBEAR.

reports that there was no measurable current in my line, which is just what I have maintained from the outset must be the case. But there have been some electricians who have declared that so far as the line was concerned there were currents in it just the same as in the common telephone lines. 3d. High electromotive force is another essential condition. A battery and a transmitter, however good for magneto purposes, will not work my receiver, for it is the function of the transmitter to vary the current, and if there be no current, evidently there can be nothing to vary.

As both transmitter and receiver are necessarily unlike any of the others, and as the transferring line is in a different electrical condition, and the character of the transformations of energy not to be found in the others, it is a system by itself.

If two receivers be placed in the same circuit uncharged (Fig. 12), and if one attempts to use the arrangement for the transmission of speech he will fail, for merely vibrating one plate near another will not generate any electrical phenomenon; but if the line be charged in any way, one may then use each instrument as transmitter or receiver. In this way I have worked successfully over a half mile of line with the most ordinary insulation.

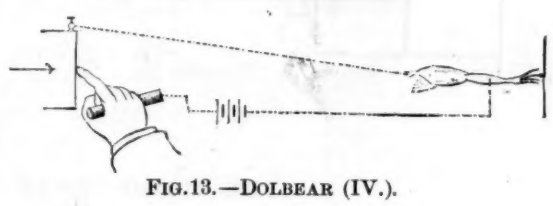


FIG. 13.—DOLBEAR (IV.).

No. 4. In 1878 I found that if an electric circuit was completed through the finger in contact with the bottom of a tin cup, the current on the line would be varied by the changes in pressure produced by sound vibrations in the cup, so that it was a variable resistance transmitter. With a dozen gravity cells and the end of the finger moistened it is a tolerably efficient transmitter.

The receiver with which I have represented this transmitter in the circuit (Fig. 13) is an ideal receiver which I have threatened to make every summer for six or eight years, but have never done it. Ever since Galvani, the experiment with the frog's leg has been a standard experiment, yet I confess that I never witnessed the phenomenon. It is said that the properly prepared leg of a frog is a particularly delicate electroscope, and that it only requires the contact of a piece of zinc and copper to throw the leg into spasms. I therefore proposed to connect such a leg with the plate of a telephone, completing the circuit through the leg, a battery and a transmitter, expecting that the changing currents would cause corresponding muscular movements in the frog's leg which would be communicated to the plate, in which case the diagram represents still another system.

BREGUET'S SYSTEM.

There is but one other complete system that I chance to know of, and that one is Breguet's. Lippmann made the

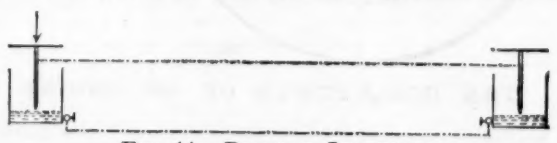


FIG. 14.—BREGUET-LIPPMANN.

discovery that the surface of mercury was visibly deformed by a current of electricity upon it from a point, and Breguet reduced this to telephonic purposes. Transmitter and receiver are both alike and have similar functions. A glass vessel contains some mercury with some acidulated water upon it (Fig. 14). A small glass tube drawn to a point but not closed is also filled with mercury and properly supported above, so that the point of the tube should be quite near the surface of the mercury. The mercury in both cup and tube must be provided with external metallic connections that an electric circuit may be completed. When these two are connected thus, any motion of either tube toward or away from the surface will be followed by a corresponding motion of the other.

There are several telephone inventions of importance, and some of them of the highest that are in the nature of improvements. Transmitters and receivers have both been made more efficient by their use, while some have only a scientific and theoretical interest. A few of these I shall notice.

Among transmitters embodying difference in principle I would name the thermo-electric pile. In 1873 I described at the Portland meeting of the American Association for the Advancement of Science an experiment I had made on the convertibility of sound into electricity, in which the vibrations of a tuning fork upon the face of a thermo-pile had developed electricity. At the time the criticism on the paper was that the vibrations resulted in heat which was the cause of the phenomenon (Fig. 15).

As soon as the magneto telephone was available for the test, I coupled it in circuit with a thermo-pile and applied the tuning fork as before, and at once heard the pitch of the fork at the receiver, and that, too, at the distance of half a mile from the thermo-pile. I have also heard the voice, but only very weakly, with a thermo transmitter. The electromotive forces are at best but about ten thousandths of a volt, and with such nothing much can be expected. As contrasted with such weak currents, an electric arc half an inch long is at the other extreme.

As the arc is exceedingly sensitive to air currents, and as an arc may be blown out with the breath, it occurred to me that possibly the changes in density in air vibrations

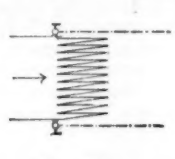


FIG. 15.

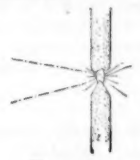


FIG. 16.

made to go through an arc would vary the current strength enough to enable sounds to be reproduced by it (Fig. 16). The sounds were directed to the arc by a speaking tube, every word spoken driving the sparks two to three inches away from the arc. The current was passed through the primary wire of a large induction coil that could not be injured by such a current of 15 or 30 ampères, the terminals of the secondary connected alternately with the magneto and the static receivers. Only the faintest show of a sound could be heard. I did, however, hear some sounds, but not speech. Whistling was plainest. I discovered one thing of interest, and of some importance too, as bearing upon future improvements in transmitters; that is, that the most sudden break of such a current produced an hundred times less sonorous effect in the receiving telephone than the break from a single Leclanché cell would give. The explanation probably is that it is impossible to produce a sudden enough break to affect the telephone so that the ear could perceive it. Not that the ordinary effect of magnetization and demagnetization are not perceived, but their gradualness prevents an acoustic effect. It was not possible to get a spark of any appreciable length by the breaking of such a current, though

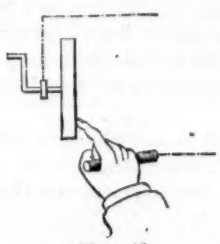


FIG. 17.

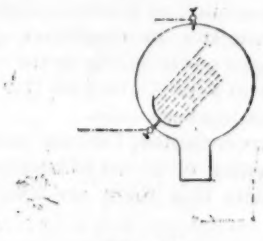


FIG. 18.

with half a dozen bichromate cells a spark four or five inches long was easily obtained. As it has been found by experience that an electromotive force greater than 3 or 4 volts in the primary circuit with a Blake or other transmitter of that kind was not so efficient as less, I take it to be explained that within the slight movable distances to which the terminals of such transmitters are subject the formation of an arc across the space is detrimental to the performance; for if there be an arc, the current is not varied, it continues right on with no considerable diminution. It is therefore necessary to use a lower electromotive force, and that from two Leclanché cells, say 3 volts, is as much as can ever be employed with such transmitters.

Elisha Gray discovered a curious electro-physiological phenomenon a good many years ago, namely, that when vibratory high tension currents passed through a finger contact upon a movable metallic surface, there was an apparent increased adhesion, and the metal gave out a sound which was the pitch of the interruption of the circuit (Fig. 17). This he modified into a telephonic receiver. The phenomenon is curious when compared with that of the motophone of Edison, for in the latter the friction is lessened by the current, while in the former it is increased.

Lastly, there are three telephonic receivers which have nothing but novelty to recommend them; but I thought you might like to know of them.

1st. An incandescent electric lamp of the ordinary sort makes a speech receiver. The current needs to be a strong one, and it performs better when the current is sufficient to heat the filament to low redness. I suppose it is to be explained by what I have described under the head of Berliner's system.

*Lecture delivered before the Franklin Institute, Dec. 11, 1885.

2d. Crookes' tubes may be similarly employed, only a high resistance induction coil is needed. By using one in which the gaseous impacts are against the side of the tube or bulb, and that held against the ear, one may hear the spoken words (Fig. 18).

3d. A Leyden jar of the ordinary pattern held, one hand grasping the outer coating while the knob is placed in the ear, the two coatings being the terminals of a secondary from almost any kind of a transmitter.

It was Hughes, of England, who discovered the great sensitivity of hard carbon and pointed out its adaptability to telephonic purposes; a discovery of such importance that if he had seen fit to patent, as he might have done, he would have practically controlled the telephone for commercial purposes. It has been claimed by those who own the right to the use of plumbago and lampblack for such uses that they also own hard carbon of any sort, but they are no more to be compared than peat and anthracite.

The properties of a body are not the properties of the atoms of the body, but depend upon the molecular constitution and arrangement of the body. It is the atom that is named carbon. It is the molecular properties that are wanted, and the molecular properties are not the same in lampblack and gas-coke. If one should discover that starch could be used for a certain useful purpose, and afterwards some other one should discover that cotton would answer very much better, and if the first should then claim the cotton because he first described an amylose for the purpose, the cases would be similar. Yet I heard Sir William Thomson say that it required but an infinitesimal amount of invention to substitute gas-coke for lampblack, and we all know what infinitesimal means to him.

The Blake transmitter consists simply in the adoption of Hughes hard carbon for the platinum in Reis' transmitter. It makes it much more efficient, but does not change its mode of operation nor vary the mechanical relations.

Hunning, an English clergyman, has made a very useful transmitter by employing granulated hard carbon arranged mechanically in the circuit as Edison arranged his carbon button, and with this transmitter the best long line work has been done.

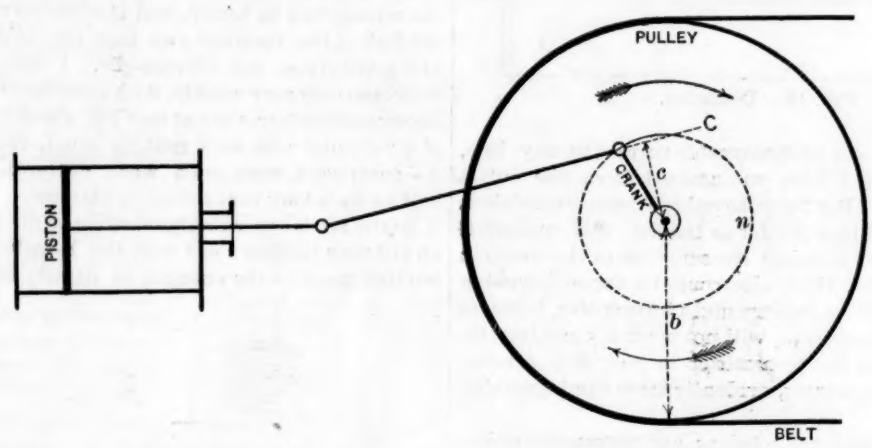
In conclusion, I do not pretend to say who was the first inventor of an art of telephony, but I think I have made it plain that there are several arts of telephony that are complete in themselves, just as there are several arts of picture painting. One man paints with a brush, another with a roller and a press. When the pictures are done no one can tell by inspection which way either was made, hence it is improper to speak of *the* art of picture making. Leaving out all that was done before 1876 I submit that the work of that year ought not to control systems that have been invented and discovered in their entirety since that time, and have almost nothing in common with it. I protest against it in the name of law which has been misjudged; I protest against it in the name of equity which has been scandalized, and I protest against it in the name of science whose eyes are not bandaged as are the eyes of justice, herself a judge, the court of highest appeal, and who writes after every signature to a judgment in her court, competent or incompetent.

The Horse-power of an Engine.

[Copyright 1885.]

BY JOSHUA ROSE, M. E.

The piston of an engine receives during the live steam period a pressure of about three pounds per square inch less than that shown by the pressure gauge upon the boiler. After the point of cut off, however, the pressure on the piston diminishes because of the expansion and its accompanying reduction of pressure; hence, the first requirement is to find the average pressure received by the piston throughout a revolution of the fly-wheel or during two piston strokes, because during one revolution the piston makes two strokes. The next operation is to multiply this average pressure by the number of revolutions the engine makes in a minute, and this gives us the total amount of power received per minute by the piston.



THE HORSE-POWER OF AN ENGINE. FIG. 1.

This power is transferred to the crank (through the medium of the connecting rod) in an irregular order because of the varying leverage of the crank.

Suppose, for example, that the parts occupy the positions shown in Fig. 1, and the effective leverage of the crank is denoted by the dotted line *c*, which is drawn at a right angle to the connecting rod and passes through the centre of the crank shaft. Now, suppose the crank moves to its position of half throw, and the effective leverage of the crank will be the length of the line *e*, Fig. 2, these two leverages being about equal, while neither of them is equal to the full length of the crank. Such an equal leverage will evidently lie between these two positions, being that position in which the crank stands at a right angle to the connecting-rod.

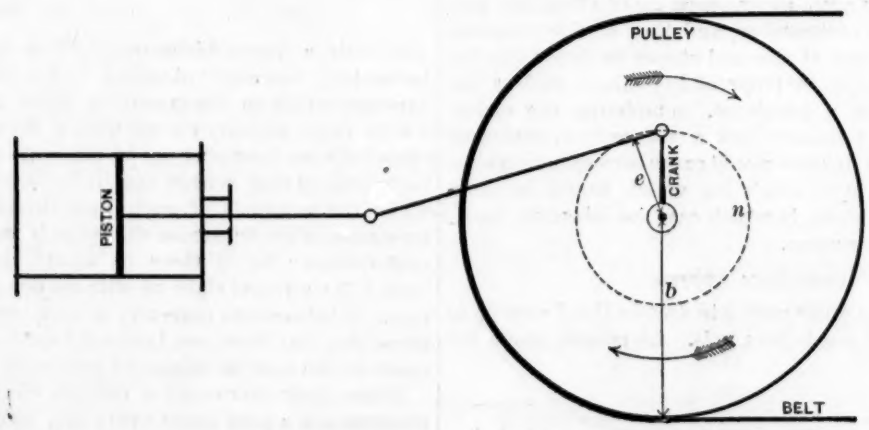


FIG. 2.

At what precise point this will be depends upon the length of the connecting-rod, and the longer this rod is in proportion to the length of the crank the nearer to half throw will the crank be at the time it is at its greatest effective leverage. Thus, in Fig. 3, the connecting-rod is made longer in proportion to the crank length, and as a result the point of full leverage is brought nearer to the position of half crank throw. Obviously, in proportion as the crank in Fig. 3 approaches the dead centre, the leverage of the crank decreases; and this has led many to assume that there is power lost in employing a crank motion. But the crank transmits to its shaft all the power the piston receives, less the friction of the surfaces of the piston, cross-head pin, cross-head guides and crank pin. Furthermore, the fly-wheel acts as a receiver of power, absorbing the fluctuations and delivering the power in a more steady stream, as it were; hence for the purpose of calculating the horse-power of an engine all we have to consider is how much power the crank receives during a revolution, and how many revolutions it makes in a minute.

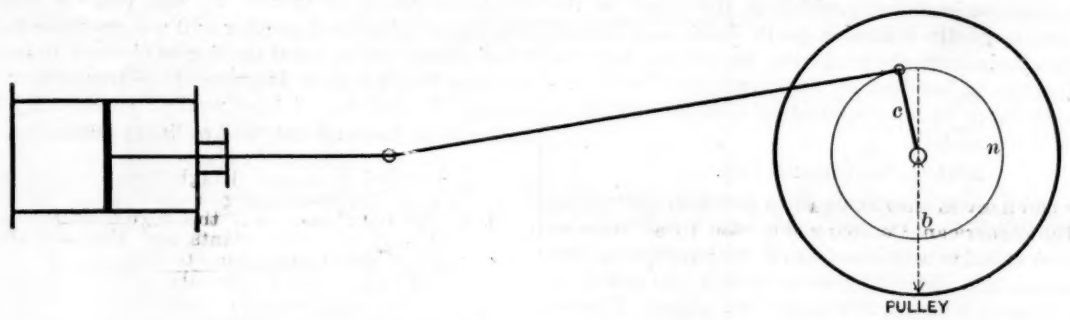
The best method of obtaining the average pressure on the piston is by means of an indicator diagram, and when this is done the indicated horse-power is obtained. If the average pressure is obtained by calculation, the horse-power may be termed the rated power, which is used for the commercial purpose of buying and selling, and not for what may be termed purely engineering purposes.

This average pressure, multiplied by twice the length of the stroke in feet, gives the amount of power per revolution, which, multiplied by the number of revolutions per minute, gives the power per minute.

Since this power is expressed in foot-pounds, or in other words in the number of pounds the engine could lift one foot high in a minute, it must be divided by 33,000 (this being taken as the number of pounds a horse can raise one foot high in a minute) and the quotient will be the horse-power.

How much of this horse-power can be utilized for driving machinery depends upon a variety of conditions, thus a given quantity of steam contains within itself if allowed to move a piston a given quantity of power, but part of this power may be lost in the condensation caused by the cylinder cooling the steam and another part is lost in the friction of the moving parts of the engine.

The principle upon which the speed of an engine (supposing the governor to be left out of the question) would adjust itself to the load may be explained as follows: In Fig. 4 we have an axle or drum supporting a weight of 12 lbs. and a wheel supporting a weight of 6 lbs.; the leverage *b* of the wheel, however, being twice that of the drum, the two are balanced. Now let *a* represent the average leverage of the crank and the 12 lbs. the total pressure on the piston, and let the wheel represent the driving pulley, and the 6 lbs. weight the resistance of the load, and (allowing nothing for friction) the resistances would be balanced and the engine would not run. It follows therefore that the average pressure on the piston multiplied by the average leverage of the crank must exceed the dead weight or resistance of the load multiplied by the radius of the fly-wheel, and that the amount it must exceed it is, supposing the load to remain constant in amount, sufficient to overcome the friction of the engine when running at the required speed.



THE HORSE-POWER OF AN ENGINE. FIG. 3.

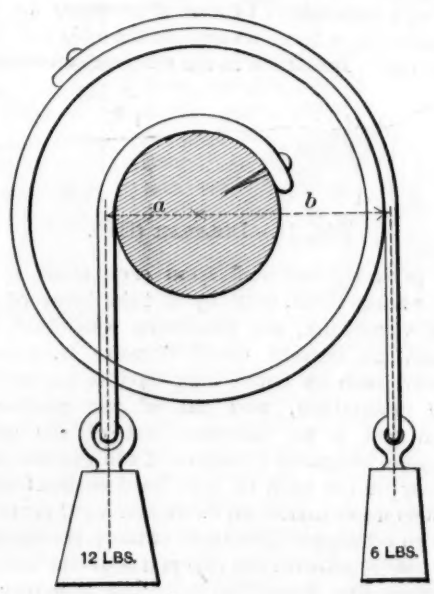


FIG. 4.

The Late Sir William Siemens.—A biography of the late Sir W. Siemens is being prepared, at the desire of the executors, by Dr. William Pole, F. R. S., honorary secretary of the Institution of Civil Engineers, and author of the life of Sir William Fairbairn. Dr. Pole will be grateful for the loan of any of Sir William's letters, or for any information of importance.

The Unburied Wires—1886.

The telegraphic spider spreads
His web above the people's heads
For miles and miles.
On ugly poles that block the ways
The wires are hung, an endless maze,
And Cyrus smiles.

To beat a greedy, grasping crew,
The many vainly fight the few,
And water wins.
By legislators cheaply bought
The public will is set at naught,
And Jay Gould grins.

The weeks and months and years go by,
And still the poles and wires defy
The Empire State.
And while a lame Commission halts
To seek a system free from faults,
The people wait.

Before another year can pass
The poles of every style and class
Must feed the fires.
And we must hide beneath the stones,
Though Cyrus sighs and Jay Gould groans,
The web of wires. —*Ex.*

The Business of the Thomson-Houston Company in 1885.

To the Editor of The Electrical World:

SIR: In your last issue is a communication from the President of the American Electric Manufacturing Company complaining that in the partial list of the business of the Thomson-Houston Electric Company for the year 1885, published in the WORLD of Dec. 26, the American Company was not properly credited with the work performed by it.

It was with no thought of doing scant justice to the American Company or any other of the many efficient representatives of the Thomson-Houston Company, that no mention of the American Company was made. None of our other representatives have complained of such omission, which was a natural occurrence, inasmuch as in preparing the list, it was not contemplated to show the proportion of the business which had been consummated by each of the various agencies of the Thomson-Houston Company, but to give a general idea of the operations of the company in different parts of the country.

The American Company was for three years one of the most active and energetic of the representatives of the Thomson-Houston Company. Working as it did in the most valuable territory in the United States and most of the time being in possession of considerable ready capital, it secured a large amount of business, and there is no desire on the part of the Thomson-Houston Company to give to the American Company stinted credit therefor.

That company had at one time a large force of active representatives, among them Mr. Geo. W. Ross, to whose organizing ability and qualities as a salesman much of the success of the American Company was due; Col. H. M. French, now the general agent of the Ball Co.; Mr. H. M. Linnell, at present the general manager of the Schuyler Co., Mr. Goff and Mr. Burgett, at present connected with the American Electric Manufacturing Company.

During the year 1885, the apparatus purchased by the American Company embraced from one-eighth to one-tenth of the output of the Thomson-Houston works, and during the three years that it dealt in apparatus of the Thomson-Houston Company, it organized by the active co-operation of the gentlemen above referred to, sixteen of the one hundred or more local companies now operating the Thomson-Houston system; the remaining eighty-five to ninety companies now operating that system have been established by the other representatives of the Thomson-Houston Company, who will pardon us if they do not find their names mentioned in connection therewith. The American Company owed whatever measure of success it attained to the same elements that are at the foundation of the success of the Thomson-Houston Company—the controlling value and importance of the Thomson-Houston system of electric lighting, backed by diligent and energetic agents.

Whatever fortunes may overtake individual members of either the American or Thomson-Houston Company, the system of lighting which has given these companies a large measure of success in the past, will continue to hold a commanding place in the electric lighting systems of this and other countries.

E. I. GARFIELD,
Sec'y Thomson-Houston Electric Co.

BOSTON, Mass., Jan. 4, 1886.

A Victory for the Bell Company.

Final decrees were entered in the United States Circuit Court at Philadelphia, on Jan. 5, in the suits of the American Bell Telephone Company and others against the Baxter Overland Telephone and Telegraph Company, Penn Overland Telephone and Telegraph Company, and the Overland Telephone Company and others. It is decreed that the letters patent granted to Alexander Graham Bell, March 7, 1876, and Jan. 30, 1877, are good and valid in law. The decree then goes on to say that "The said Alexander Graham Bell was the original and first inventor of the inventions described in said several letters patent; that the title thereto and to the inventions described and claimed therein are vested in the complainants, and that the defendants have infringed the fifth claim of said letters patent and the exclusive rights of the complainants under the same. And it is further ordered, adjudged and decreed, the complainants having an account and assessment of profit and damages and accepting a nominal sum therefor, that the defendants pay to the complainants the sum of $1 as such profit and damages, and also costs taxed at the sum of $25, and that the complainants have judgment and execution therefor; and also that the said defendants be perpetually enjoined and restrained from making, selling, or using the said improvements patented as aforesaid, or either of them, and that an injunction issue accordingly."

NEW YORK NOTES.

OFFICE OF THE ELECTRICAL WORLD,
Jan. 5, 1886.

The Union Electric Company of 1 Ann street, this city, are going into the manufacture of electro-plating apparatus for students, and other work of similar nature. They offer an unprecedented and novel—not to say ingenious—inducement to purchasers of their apparatus by giving three lessons free in electrical theory and practice, so that the merest tyro can learn inside of a week how to handle the miniature plant in which he has invested, and to furnish good reasons for what he does. This idea is a good one, as the plan serves to supplement what is taught in the books, and furnishes an education of hand and eye, as well as of the memory.

Mr. W. L. Boyd, a gentleman well-known in electrical circles, is now representing the Empire Steam Pump Company, of Carthage, N. Y., at 12 Cortlandt street. I became quite interested in the lucid explanation he gave me a day or two ago of the operation of the pumps he has on view. These pumps have a reputation for their regular and continuous flow of water, rendering them highly suited to electric light plants, where a steady, reliable water-feed to the boilers is of the first importance. I could profitably occupy much space by going into details, but the circulars of the company give ample information, and I would suggest that parties putting in electric light plants or otherwise requiring pumps call at Mr. Boyd's office and satisfy themselves by personal investigation as to the advantages gained.

Hine & Robertson, at the same address—12 Cortlandt street—have just put in one of their damper regulators for the Bridgeport Electrical Light Company. The firm have succeeded in convincing a good many of the smartest electric light men that the regulator is a necessary adjunct to all first-class plants, and they are accumulating a number of very flattering testimonials.

The United States Electrical Company are now preparing, and expect to have ready in about two weeks, their new catalogue of electrical goods. Dealers and large buyers should send in their names and addresses so as to be "on time."

Mr. W. H. Bernap, 259 West 27th street, manufacturer of Davis & Kidder's magneto electric medical machines, for all purposes pertaining to electro-medical treatment, has liberal facilities for turning out these machines in large numbers at his factory, and reports an active demand. His facilities enable him to quote very favorable prices.

J. H. Bunnell & Co. are as busy as ever in catering to the various needs of the electrical business, with whose growth they grow; and glancing lately over their catalogue, a copy of which ought to be in every place where electrical supplies are used, I was impressed with the range and variety of their departments. With a pushing firm of this kind it would not be safe to fix any limit for the size of their catalogue, even a short time hence. Each day sees some new want, and sees it filled by them.

Not long ago, Brooklyn was one of the most unprogressive of American cities as regards electric lighting. Now, it is one of the most advanced. Many of her finest thoroughfares rival New York's Broadway in the brilliancy of their electric illumination, and when skating begins, the sheets of ice in Prospect Park will reflect in sparkling beauty the dazzling arc lamps strung around the lakes. It occurred to me to make a few inquiries also as to private electric lighting, and it is gratifying to find that the advance is marked, thanks chiefly to the endeavors of the Excelsior Electric Company, who have made the most of the opportunities given them for effective display in three leading drygoods stores. The new and magnificent store of Wechsler & Abrahams, on Fulton street, is now lighted throughout by their system, 60 arc lamps being in use in the principal departments, while the art room, the private office and basement stories are lighted by 80 incandescents, supplied by the same company. Two 30-light machines are in use for the arcs, two 15-lighters being held in reserve for extra or unusual work; and one 75-light machine feeds the incandescents, a small machine being ready for emergencies. In response to my query as to how they liked the system, the firm said, very courteously, that it afforded them great satisfaction. Mr. Benj. S. Lynch, the electrician and engineer, exhibited the plant to me, including a 100 horse-power Nelson W. Twiss engine, making 80 revolutions with a 30-foot fly-wheel. Mr. Lynch spoke in high praise of this engine, and is evidently not partial to high-speed engines.

On calling at the splendid establishment of Frederick Loeser & Co., I was informed by the firm that they use 103 Excelsior arc lamps of 2,000 candle-power each, scattered at irregular intervals all over their vast warerooms. I do not know how true it is, but the claim is made that the firm are using more lights than any other retail drygoods house in the United States. They are so well pleased with their plant as to say that "it is indispensable," and that "the advantages are greater by 100 per cent, than the cost." They make an excellent point in saying that "all good stores must have the electric light." Four 30-light Excelsior dynamos are in operation, run by a 100 horse-power Nelson W. Twiss engine; and there is an auxiliary 30-light Brush dynamo.

Hurd, Waite & Co. are using 33 Excelsior lamps run from one 15-light and one 20-light machine, with a Straight Line 50 h. p. engine. They "could not do without it; gas is cheerless." S. Wechsler & Brother have 24 Excelsior and 7 Thomson-Houston lamps.

Almost next door to Wechsler & Abrahams' is the store of A. D. Matthews & Sons, dry goods, where 36 Excelsior arc lamps are in constant service. They are operated by two machines—one 15-light and one 30-light—which in turn are run by a fine 50 h. p. Armington-Sims engine. Mr. Matthews speaks in the warmest terms of praise of this plant. It deserves note that the firm were so careful to get a perfect light and to avoid jarring of the apparatus that they planted the foundations for the machines 10 feet deep—2 feet deeper than they intended.

Near by again is the large store of Cowperthwaite & Co., who have installed a plant of the Consolidated Electric Light Company's system (Sawyer-Man). They have placed 50 incandescent lamps in most effective and attractive electroliers made by Vosberg & Co., the noted Brooklyn manufacturers of gas fixtures, who occupy an adjoining store. The firm are pleased with the light, and Mr. Annerman, secretary of the concern, says he is surprised at its beauty. He had had an idea that it would affect his sight, but, on the contrary, he finds the light agreeable. The new addition to the store contains 8 fine new electroliers. Mr. J. H. Swartz is the electrician and engineer. He is running a 100-light machine with a 20 h. p. Erie engine, which he likes very much, and from which, too, is run the large Morse & Williams elevator without any appreciable effect on the lamps.

I might go on and speak of the Edison lights in Dieter's restaurant, or the plant at the Hamilton club, or the grand show of Weston arc lamps on the Brooklyn Bridge. But enough has been said to show that Brooklyn is fast becoming one of the chief centres of electric lighting.

Tucker & Baxter, 40 Fulton street, manufacturers of electric specialties and apparatus, and cabinet work for electrical instruments, have secured the whole building on a long lease. The top, third floor, is alloted to fine brass work, the second floor to fine cabinet work, and the first floor to offices, salesroom and exhibition tables. The firm are very enterprising, and are now making special preparations to meet a large demand for their new Automatic Temperature Regulator, noticed and illustrated in the last issue of the WORLD.

Stout, Meadowcroft & Co. have ready their new style of acid batteries for electric lighting. The batteries yield an 8 ampère current, with an E. M. F. of 2.22 volts. The internal resistance is one-sixteenth of an ohm. They tell me they have had an incandescent lamp of 3 candle-power, with a current of 1½ ampères and 6 volts, on 3 cells for 165 hours continuously, day and night. This being so, I need not enlarge on the resultant demand. W. T. H.

NEW ENGLAND NOTES.

BRANCH OFFICE OF THE ELECTRICAL WORLD,
BOSTON, Jan. 4, 1886.

A certificate of organization has been issued to the Atlantic Telegraph Company of Massachusetts. The offices of the company are located in this city, and the capital stock is $5,000. Mr. Parker C. Chandler is president and Mr. Chas. G. Winter treasurer. The corporation is constituted for constructing lines of underground and aerial wires, both within and without the limits of the State; for the maintaining and operating and owning of interests of said lines.

Mr. Horace B. Parker and others, of Newton, Mass., will petition the legislature for incorporation as the Newton Street Railway Company, and to furnish electric power within the limits of the town of Newton. The proposed capital is $50,000, and the motive power of the railroad—which the company is to build—will be electricity.

The Boston telegraphers have formed a mutual aid society. This organization will arrange the preliminaries for a ball to be held about the middle of the month of February at Odd Fellows Hall, to raise a fund for the relief of disabled telegraphers.

On Christmas morning, Mr. Geo. W. Adams, General Manager of the Boston Electric Protective Association, was the recipient of a beautiful and expensive gold-headed cane engraved as follows: "Presented to G. W. Adams, Supt. B. E. P. A., by the Night Patrol, Dec. 25th, 1885."

The Chemical Electric Light and Power Company have fitted up the elevators of the New York Life Insurance Company, 95 Milk street, with their "chemical" apparatus for incandescent lighting.

The New England Telephone and Telegraph Company had another meeting of its board of directors last Thursday, but the meeting did not result in the declaration of a dividend. The question under consideration was a plan of reorganization upon the basis of a decrease in the capital stock, the issuance of preferred stock, and the raising thereby of the necessary amount for construction purposes. No definite action, however, was taken. The capital stock is $12,000,000, of which $7,815,600 would be entitled to dividends on any distribution.

The Edison Company for Isolated Lighting is installing an additional 150-light plant in the Boston Sugar Refinery, East Boston, making altogether—when the new equipment is put in—a total of 210 incandescent lamps. The initial plant of 60 lights, furnished by the Edison Company to the above named concern, has been running satisfactorily for several months, hence the demand for more lamps.

Report comes from Worcester, Mass., that an election of an electrician, which was to have taken place Dec. 28, was postponed on account of a heated debate over charges made against William Brophy, who has held the office of electrician ever since the fire-alarm system was introduced in that city. The Fire Board then adjourned until next Wednesday, when an investigation will be held.

The Judkins Railway Train Signal Company have commenced equipping the trains of the Central Massachusetts Railroad with their electric signaling apparatus. This railway is operated by the Boston & Lowell Railroad, which will also have the Judkins signal in all its trains before the summer season. W. I. B.

PROVIDENCE, R. I., Jan. 5, 1886.

During the month of November the Electric Time and Messenger Company made a net increase of forty-three dials in this city and Newport, while the Boston company gained forty in the same time.

Mr. E. M. Carhart, manager of the Holmes Burglar

Alarm Telegraph Company, reports that of late there has been an unprecedented demand for his company's system among the leading mercantile houses of this city, especially since the recent Dorrance street robbery.

Mr. Geo. A. Mayo, formerly of the Mayo Electric Manufacturing Company, of Boston, and now connected with the Narragansett Electric Lighting Company, of this city, met with a serious and almost fatal accident while at work recently at the plant of the latter company. A few nights ago, Mr. Mayo, while oiling the machinery, noticed that one of the brushes on a dynamo had become unfastened, and in attempting to put same in proper place, his hands slipped and he received a terrific electric shock, which threw him down with great force, and rendered him unconscious for some time. Several fingers and the palms of both hands are badly burned; in some places the holes being as large as the end of a lead pencil. Although suffering from his injuries, Mr. Mayo was at his post the night following the accident.

Mr. F. H. Gardiner, for so long identified with the R I. Telephone & Electric Co. as its popular assistant general manager, severed his connection with that corporation on the first instant. Although quite young in years, Mr. Gardiner is well up in "electricals," and his opinion and judgment have been frequently solicited by other electricians. He would prove an invaluable acquisition to any concern, where the services of a practical and reliable electrician are required. W. I. B.

PHILADELPHIA NOTES.

BRANCH OFFICE OF THE ELECTRICAL WORLD,
PHILADELPHIA, Jan. 4, 1886.

The first of January has come and gone, and there was no cutting of the wires. At the last moment City Councils got together and instructed the proper officers not to cut the overhead wires (as the law had directed) and appointed committees to "confer" with the officers of the telegraph companies. This result was obtained by the persistent and able management of the Western Union, although that company has least of all to fear the compulsory underground scheme. The Baltimore & Ohio Company will in due time feel the pressure most. The city's own wires—police patrol and fire-alarm telegraph and telephone wires—will never go underground, and thus we shall see by and by the spectacle of the city being the first to violate its own laws by maintaining indefinitely an overhead system of wires. The enforcement of the underground law with regard to electric light wires will result in the extinction of the light in the outlying sections of the city and a return, Philadelphia-like, to the glimmering old gas-light. The Western Union will have very little underground work to do on its main lines. They will enter the city on the Pennsylvania (Elevated) Railroad—private property—and thus reach Broad street station, only 300 yards from their new main office, which they can reach with only a square's length of subterranean work. From the main office pneumatic tubes will be laid under the streets to the offices down-town, and then the city will, as far as the Western Union is concerned, be free from overhead wires and poles in the streets. This work will be finished this year; then it will behoove the Baltimore & Ohio to bestir itself, for the Western Union, having put its own wires out of sight, will become a fierce advocate of underground telegraphy and telephony.

Some weeks ago the American District Company cut loose from the Western Union and joined hands with the Baltimore & Ohio. The Western Union promptly entered the local messenger field on its own account. The idea is to compete with its late partner for the local messenger service of the city, and it has already become a formidable rival. American district wires were cut and thrown from Western Union poles, and as the latter company had to deliver its own messages it concluded also to establish messenger, cab and coupé service, putting up a call box in every Western Union and Philadelphia local office in the city, of which there are about sixty. Moreover, the Western Union is putting up call boxes free of charge, and there will be no yearly rental. It has not yet, however, established a police or fire service, though they promise to do so.

The Western Union has finally closed its former main office at Tenth and Chestnut streets, and is now fully installed in the capacious rooms of the Old Tabernacle Church at Broad street.

The past year has seen a great improvement in the electrical management of the police, fire and hospital system. In addition to telegraph instruments, telephones have been placed in every fire engine and truck house. This arrangement affords two wires over which alarms of fire can be sent out from the Central Station. One operator sends the alarm over the regular fire wires, while another repeats the number of the box over the telephone wires, thus insuring the sending of the alarm if either of the lines should not be in working order.

A photographer of this city tells a story which should be preserved as one of the most curious incidents in the history of the telegraph. Ascending to the roof of his house he saw far off in the distance a number of linemen on another roof working in various positions at the wires. There were five wires, and they stood out clearly against the white sky. The bodies of the busy linemen were mere black dots and perpendicular strips, and the whole thing presented the appearance of an enormous clef of a musical score, the men being the notes. Seized with an inspiration the photographer took an instantaneous picture of the scene. Being no musician, he was unable to read the novel score, but took it to a pianist. The latter put the piece on the music rack and, following the notes, played off the first few bars of "How Paddy Stole the Rope." There are no affidavits vouching for the accuracy of the story, but it is at least a very neat piece of composition.

During the last year things in an electrical way have improved very much in this city. The establishing of branch houses of several of the electric light companies has served to awaken a competition which has made affairs lively in that field. Many new plants have been put in and a large number have been contracted for. Although the year opens with the Bell people in possession of the entire telephone business, there is a rumor that this city will soon furnish another litigation for them.

The telegraphic field has decidedly improved, for while the opening of last year found the Bankers & Merchants' struggling along with its load of indebtedness, the present sees in her place the United Lines doing a splendid business. The Baltimore & Ohio has improved during the year. The Western Union finds in these two companies a great opposition to its former monopoly. While the progress has not been very rapid in underground matters, it has been as much so as could be expected.

The Thomson-Houston Company report business as very encouraging for the coming year. They have had a largely increased business of late.

The Maxim Electric Company have had splendid business during the year, both with their arc and incandescent lights. The Edison Company have done well here, and have a beautiful display of their lights in the Temple Theatre of this city. The Penn Mather Company, although they have been here but a short time, are having success with their lights. They have just finished the 250-light plant at Thron's Broad Street Garden, and have a contract for a plant at Norristown.

The Ball Company have their lights in fine working at the Cyclorama.

The large cable of which I spoke in a previous letter as having been made by Alfred F. Moore of this city, has been covered with lead by the Tatham Bros., by their new process, and insulated by the David Brooks, Jr., process of insulation. The cable is 1,250 feet in length and contains sixty-five wires, and the covering was made without a joint—something very rare.

The Dynamic Company, which was burned out here last week, has taken temporary quarters at 305 Walnut street, and will in about a week be able to fill orders. Mr. Griscom, the president, informs us that the loss on stock will be about $5,000 above the insurance. The company will resume at its old quarters as soon as they are repaired.

Shaw & Geary are about to begin the manufacture of electric gas burners and call bells, for which they have lately been granted patents.

I am in receipt of a very finely illustrated catalogue from the Hall Duplex Steam Pump Company, 91 Liberty street, New York. This pump received the silver medal at the recent novelty exhibition held here and is in brisk demand. E. F. I.

CLEVELAND NOTES.

Dec. 26, 1885.

The city of Canton, O., is rather backward in electric lighting, there being but a small Brush plant there furnishing 23 lights.

Alliance has two small plants, one arc and one incandescent, used for lighting the city and stores. The managers report the plant as increasing.

At Salem the Buckeye Engine Co. have a plant which furnishes light for their works and ground. This company have, by the way, one of the most serviceable engines now being used by electric light companies. It received the first premium at New Orleans. They have furnished 45 engines for electric light companies during the past year, and are now constructing some to be used in Mexico for this purpose. They have just issued a very handsome catalogue, naming the different places where they have sold engines the past year.

Thomas C. Sharp & Co. are builders of a very fine automatic cut-off engine, which is highly recommended for electric light work. Mr. Sharp is one of the pioneer engine builders of the country, and has now in process of construction an engine expressly designed for running large plants.

The Forest City Electrical Works have removed from 144 Superior street to 26 South Water street. They have discontinued the telegraph and telephone supply business, and are engaged exclusively in electric light supplies. Their business is reported as very good by Mr. W. B. Cleavland, the electrician for the company.

The business done by the Brush Electric Company has been larger during the past year than ever before. Their installation of both arc and incandescent systems in this country has been beyond all expectations, and their foreign business has been very large. They have in successful operation plants in Mexico, Central and South America, China and Japan. Their carbon business has grown to large proportions, and is continually increasing. They have been compelled to add to their already large factory, and are now contemplating the erection of new buildings. The works are run day and night, and give employment to a large number of men. The company, during the year, have had great difficulty in procuring skilled men to erect plants, thus proving what THE ELECTRICAL WORLD said some time since, that there was "open for the young men of to-day a new occupation," if they would but qualify themselves. They have just issued a very finely illustrated catalogue, which is full of matter pertaining to their system of electric lighting, copies of which they will be pleased to furnish on application. Your correspondent desires to thank Mr. Swift and Mr. Potter of this company for the manner in which they treated him while in Cleveland.

The Cleveland Motor Company are having considerable trade. These motors are well spoken of and seem to give general satisfaction.

The Cowles Electric Smelting and Aluminum Company are erecting large works at Lockport, N. Y., which will, when completed, be able to furnish the trade with their product, which they cannot do with their present capacity. In their new factory they will use a dynamo built by the Brush Electric Company, which is one and one-half times larger than any yet built. It develops 1,527 ampéres and 47 volts. The circuit is composed of twenty No. 1 wires. They expect to use another dynamo still larger.

The Forest City Carbon Company are running day and night, and are just now increasing their capacity, as noted in THE ELECTRICAL WORLD last week, having found that they could not accommodate their fast increasing trade with present facilities. The carbons manufactured by this company are very highly spoken of by the electric light people using them. Holmes, Booth & Hayden are the sole agents for these carbons, and have them in use by many of the electric light companies. The company is composed of M. A. Devitt, president; H. C. Adams, vice-president; J. Perry Lucas, secretary, and Arthur Cowdrey, treasurer, all young men and deserving of success.

The Cummer Engine Company report trade as very good during the past year and they see a very promising outlook for the coming one. Their engine has been quite successful in running electric light plants. They had considerable business in this field and are now in negotiation for contracts with several companies.

The Boulton Carbon Company are very busy. Their production is about 1,500,000 each month, for which they find ready sale, both in this and other countries. They make a good carbon, which is highly spoken of. Mr. Masters, the president, is now in California, and reports the prospect for trade there good.

The Brush Electric Light Company of this city are just completing a 1,000 light station, which will be very complete in all its equipments. It will be two stories high, the upper floors to be used for office, dynamo and testing rooms; the first floor to be used as boiler and engine rooms. They will use one Reynolds Corliss condensing engine, 2 White engines and 2 Ball engines. The 2 Ball engines will be used for day work. The boilers are made by the Globe Boiler Company, and are being fitted up by the Warwick Manufacturing Company. They use the Banman automatic door on the boilers, which does away with closing the door after throwing in the fuel. The belt used on the large Reynolds Corliss engine is 38 inches; the Ball and White engines require 24 inches, which will be furnished by the Hoyt people. The boiler-plate pits for water are 51 feet long, 4 feet wide and 8 feet deep. The smoke-stack is 105 feet high, with a 50-foot flue. The oiling of the bearings is quite novel; the oil drops on to the shafts from angle-valves and is caught underneath by a pan, then conducted to a tank and pumped up into a filter on the second floor for use again. All the shafting and pulleys are on the floor in the engine room, doing away with overhead reaching and the danger attending such operations. The floors are double thickness; the second floor is made entirely of oak.

The management expect to move into this new station in January, and will then be in readiness to furnish both arc and incandescent lamps for commercial lighting. Mr. H. E. Cook, the superintendent of the company, has long been recommending this station, and is certainly deserving of a great deal of credit for the way in which he has worked in his old crowded quarters at 71 Ontario street, to keep the light up.

Mr. A. B. Lyman, electrical supplies, expects soon to commence the manufacturing of supplies in large quantities. This trade is increasing right along, and will early necessitate his finding more commodious quarters.

The Cleveland Electric Company are the manufacturers of a fine watchman's signal, for which they are having a large sale. They also carry a full line of electrical supply goods. E. F. I.

WESTERN NOTES.

BRANCH OFFICE OF THE ELECTRICAL WORLD,
CHICAGO, Jan. 2, 1886.

The sensation of the week in electric lighting has been the starting up of the circlet of electric lights recently placed at the very top of the new Board of Trade tower by the Sperry Electric Light Company. During the construction of the Board of Trade building, the idea of crowning the great tower, which rears its head more than 300 feet above the streets of the city, with a corona of electric lights was conceived by Mr. Sperry. The largest cluster of lights, throwing out the greatest amount of illumination from any one point in the world, was Mr. Sperry's idea, and he was joined in the project by the Board of Trade officials, the latter being extremely active in enlisting the interest of adjacent property owners in the proposed illumination. It was intended that the lights should be turned on at the inaugural ball. Serious illness upon the part of Mr. Sperry interfered, however, and when he had regained his health the project had about fallen through. He immediately set about to revive it, and, with the aid of the gentlemen above-named, succeeded in doing so. The arrangements for the illumination were as follows: The Sperry Electric Light, Motor and Car Brake Company were to furnish the lights, place them in position and operate them; the Board of Trade was to furnish the use of their machinery and steam power, and the balance of the cost of maintenance was to be sustained by subscriptions from the railroads, hotels and other owners of surrounding property.

Accordingly two weeks ago work was begun upon plans drafted by Mr. Sperry. To the top of the tower were fastened four arms or trusses of 14½ feet in length. These were arranged in the form of a cross. From them the corona is suspended by four three-quarter inch steel wire cables. These cables run through pulleys in the outer ends of the arms and are connected with drums placed in the clock-room in the tower. By means of these drums and cables the corona is lowered to the balcony, just over the clock-dials, where the lamps are accessible to the trimmers. The corona, or circlet upon which the lamps are bolted, is made of four-inch gas-pipe curved into a circle 29 feet in diameter. The lamps are fastened to the outer edge of this enormous ring and give the light a diameter of 30 feet. There are twenty of these lamps, each of 2,000 candle-power, located around the circle 4 7-10 feet apart. They are of the double carbon pattern and would burn for fifteen hours if necessary. The corona weighs 1,900 pounds. The lights are to be kept burning from dusk to dawn of every day in the year. The electric current is supplied by a twenty-light dynamo of twenty-nine ampères, and requires for its service about one one-third of the power of the 60 horse-power high-speed engine which drives it. The engine makes 225 revolutions per minute, while the dynamo maintains a speed of 725 revolutions. These are located in the basement of the building.

The plant was completed Thursday, and at 5:30 o'clock New Year's eve the current was turned on. The brilliant illumination, so suddenly turned upon them, attracted the attention of everybody on the street in the business portion of the city as soon as the light flashed out from the great tower, and it was a subject of a great deal of comment. The light is very powerful, and lights the streets thoroughly for blocks around. To those who saw it from a distance, the rays were blended, and the twenty lights, 40,000 candle-power strong, appeared as one vast mass of light. The light was visible from St. Joseph, Mich., and other places upon the other shore of the lake, 60 miles away. It was a conspicuous object to people coming in on railroad trains, and it is said the light can be seen from the lake off Milwaukee.

I am in receipt of a pamphlet entitled a "Treatise on the use of Steam Power in Electric Lighting Plants," from the Pond Engineering Company, of St. Louis. The specialty of this company is the equipment of electric light plants. In their work they use the Armington & Sims Engine, the Jarvis Furnace, the Sheffield Grate-Bar, the Lowe Feed-Water Heater and Purifier, the Blake Steam Pump, the Korting Tube Injector, the Jenkins Valves, and the Schultz Fulled Belting. The following is a list of the late plants

equipped by the Pond Engineering Company. The company will be glad to send their catalogue to any one requesting it: Exposition and Music Hall Association, St. Louis; J. Kennard & Sons, St. Louis; Public School Library, St. Louis; St. Louis Sugar Refiner, St. Louis; Thomson Houston Electric Light Co., St. Louis; *Globe-Democrat*, St. Louis; *Westliche Post*, St. Louis; Kauffman Milling Co., St. Louis; U. S. Steamer "Mississippi," St. Louis; Pope's Theatre, St. Louis; Grand Opera House, St. Louis; N. K. Fairbank & Co., St. Louis; State Insane Asylum, Fulton, Mo.; State Deaf and Dumb Institute, Fulton, Mo.; State University, Columbia, Mo.; Thomson-Houston Electric Light Co., St. Joseph, Mo.; Kansas Penitentiary, Lansing, Kan.; Kansas Insane Asylum, Topeka, Kan.; Jenney Electric Light and Power Co., Fort Wayne, Ind.; Jenney Electric Light and Power Co , Peoria, Ill.; Merchants Electric Light and Power Co., Danville, Ill.; Western Nail Co., Belleville, Ill.; Greeley Electric Light Co., Greeley, Col.; Davenport Gas Light Co., Davenport, Ia.; Davenport Electric Light Co., Davenport, Ia.; Capital City Electric Light Co., Des Moines, Ia.; Des Moines Edison Light Co., Des Moines, Ia.; Anamosa Penitentiary, Anamosa, Ia.; Little Rock Electric Light Co., Little Rock, Ark.; Houston Electric Light Co., Houston, Tex.

The present quarters of the Electrical Supply Company's Western House having become too small to meet their business requirements, they will move about Jan. 15 to the ground floor of 171 Randolph street, where, with a more convenient store and larger stock, they will be better prepared to serve their customers.

Mr. L. J. Phelps, of the Phelps Induction Telegraph Company, New York; Mr. J. A. Wetmore, of the Okonite Company, New York, and Mr. I. C. Frenyear, of Boston, were callers at this office during the last week.

Among the late orders of the Fort Wayne Jenney Electric Light Company are the following: Selma, Ala., 100 lights; Birmingham, Ala., 50; Huntington, Ind., 100; Decatur, Ill., 50 and 8 towers. These are all for city lighting. Also the following isolated plants: Panorama, Philadelphia, 30 lights; Government canal at Louisville, 12.

Madison, Ind., has decided to use electric light for lighting a portion of the city. A committee, composed of the Mayor of the city and a number of the Council, visited Indianapolis this week to inspect the Jenney system as used by West Indianapolis. They expressed themselves as well pleased with the light, and before leaving contracted with the Jenney folks to furnish them a plant for fifty arc lamps, of 2,000 candle-power each.

The Baltimore & Ohio Telegraph Company have about completed arrangements for connection with Terre Haute, Ind., where at present there is no opposition to the Western Union. It will take something in the neighborhood of thirty miles of line to connect with the line at Worthington, Ind., now working between that point and Evansville, Ind.

The Merchants and Manufacturers' Exchange of Lafayette, Ind., has decided to close a contract with the Baltimore & Ohio Telegraph Company for the establishment of an office in that city. Five thousand dollars have been subscribed by the merchants of the city, and will be paid to the telegraph company, who agree to establish a line from Lafayette to Logansport, refund all subscription money to subscribers by use of the line, and further agree to maintain the same rates for messages as are charged at Indianapolis, for a period of five years. The office will be established at once. W. A. K.

THE TELEGRAPH.

Nashua, N. H., is putting in an electric fire-alarm system.

After Western Union Property.—Having discovered two pieces of unmortgaged property on Dey street, adjoining the Western Union Building, Under Sheriff Aarons said Saturday that he would immediately proceed to advertise the building for sale. This will take six weeks to do according to law.

Merely a Mistake.—Having cut a number of wires used in the Commercial Telegram Company's "ticker" service, as noted in our last issue, the Western Union Company found out it had made a "mistake," and intimated that the wires could be had if called for. This hardly suits the parties aggrieved.

Pole Troubles.—A dispatch of Dec. 31 from New Haven says: There is a conflict of authority in the city government as to whether the Board of Public Works or the County Commissioners have the power to grant permission to the United Lines Telegraph Company to erect telegraph poles within the city limits. In the City Court to-day Judge Deming reserved his decision in the case of ex-Governor Bigelow against the company for erecting poles on his premises.

Sad End of an Operator.—Edward B. Douglass, a Western Union telegraph operator, aged 35 years, was found dead in his room at No. 55 James street, last Saturday morning, by his friend Jesse Faukenburg, who had roomed with him for some time. Near the body was a small bottle which had contained morphine. Douglass had suffered severely from rheumatism for some months, and Mr. Faukenburg believes his dead friend took the drug to relieve his sufferings and not with any intention of committing suicide. Douglass made a number of calls on New Year's Day, and returned to his room, about 9 o'clock in the evening, slightly under the influence of liquor. Faukenburg entered the room about midnight, and, having some important information for Douglass, attempted to arouse him, but found that he was dead. Douglass was married, but had been separated from his wife.

THE TELEPHONE.

Not Admissible as Evidence.—At Washington, on New Year's Eve, Judge MacArthur had a witness before him whose evidence was a conversation he had with a defendant over the telephone. The evidence was ruled out as not admissible.

Leavenworth, Kan.—A cross between telephone and electric light wires occurred on Dec. 28, causing an alarm of fire in the telephone exchange, but not doing much damage there. Miss Alice Davis, one of the exchange operators, received a severe shock while giving the alarm.

On Trial for Murder.—The trial is going on at Salem, Mass., of Henry K. Goodwin, the telephone inventor who shot Albert Swan a few months ago, believing, it is said, that Swan was playing him false in regard to patents. The plea of the defense is insanity, to establish which a large quantity of evidence has been put in.

Burlington, Vt.—There seems to be a possibility that the exchange in the city of Burlington may be discontinued, unless certain obstacles and difficulties placed in the way of the management by local parties are not removed. Assistant Manager Denver, of the New England Company, has not hesitated to characterize some "damage claims" as "nothing more than a blackmailing scheme."

A Perpetual Injunction.—In the United States District Court, at Baltimore, on Jan. 2, Judge Morris granted a perpetual injunction restraining the Maryland Overland Telephone and Telegraph Company from using four patents issued to Alexander Graham Bell in 1876 and 1880 for improvements on the telephone. The suit was brought to determine Bell's right to protection, and only nominal damages were asked and granted.

Tropical.—The Tropical American Telephone Company has declared a dividend of 1 per cent., or 10 cents per share, payable to stockholders of record Jan. 1, on the 15th of January, 1886. This is the third regular semi-annual dividend, and equals 8 per cent. per annum on $2.50 per share, or $1.50 above to-day's price. The International Bell Telephone Company, limited, has declared a dividend of 2½ per cent., payable Jan. 4, 1886. This is its second annual dividend, making 5 per cent. per annum. Holders of Continental Telephone Company get 3 per cent. annual income from these two stocks.

The Nebraska Telephone Company pays a dividend of 1½ per cent. for the two months of November and December, 1885. This is at the rate of 8 per cent per annum, which, by the way, is the regular rate. The object of paying at this time is to close the fiscal with the calendar year, the fiscal having heretofore begun May 1. The outlook is very flattering; 36 orders were filled in Omaha alone in December, and the net gain of the company for November and December was over 120 subscribers.

Telephone Litigation.—In the United States Circuit Court, at Louisville, Ky., on December 29th, Judge Barr rendered a decision, by consent, making perpetual the injunction recently granted the American Bell Telephone Company with reference to certain telephone patents. The defendants in the suit were the Overland Telephone Company, of Lexington, Ky., and the Richmond Telephone Company. The judgment was an agreed one, as the counsel desire to await the decision of the Supreme Court in a case sent from the Southern District of New York, involving the same points. The complainants claim that the principle of the telephone is entirely covered by the Bell patents.

The First Telephone in Arabia Felix.—By this time, no doubt, the gentle Arab is fairly conversant with the telephone, but the case was different when, some half dozen years ago, two Europeans paid a visit to the Sultan of Lahej, at Al Hautah, in the province of Yemen. As a propitiatory offering to the Chief, they took with them a pair of telephones and about a hundred yards of wire, which they ran up between the courtyard of the Mud Palace and the Council Chamber, in which latter some twenty headmen were squatting in company with their master. The first whisper that came through the telephone had the effect of sending them all scuttling away like a swarm of land crabs on the approach of an invader; but they were eventually soothed and brought back again. The sultan, at first highly interested in the "little foreign talking devil," at length grew tired, and complained that it did not speak Arabic. He was assured that it spoke all languages, and in proof thereof a polyglot individual was taken to the other end of the line and made to chant the praises of his Highness in a crescendo, which ran the gamut of the thirty-nine dialects of Arabia. Before, however, the telephone had a chance of properly vindicating its character the Council Chamber was cleared; even the dignity of the Sultan being unable to withstand *too* much magic.

THE ELECTRIC LIGHT.

Lancaster, Pa.—A local Edison company has been organized in this city.

The Light of Asia.—The King's palace in Corea is now lighted with electricity of the Yankee brand.

An Electric Light Franchise has been granted to Frank Eldridge, for the city of Huron, Dakota, the light to be furnished within one year, each light at $15 per month.

Under the Bright Light.—A New York reporter affirms that the Brush lights on the tower at Madison square are so bright that people are in the habit of raising their umbrellas or parasols in passing that way at night.

Omaha, Neb.—The Thomson-Houston Electric Light Company are enlarging their plant by putting in a 65 horse-power Westinghouse engine and two new 30-light dynamos. The Sperry and Weston systems are running at full capacity.

Pottsville an Exemplar.—Pottsville, a borough of 15,000 inhabitants, has just decided that it wants electric light in all its streets instead of gas. What puzzles the average citizen among Philadelphia's million of people is that Philadelphia cannot have electric light in all streets, too, like Pottsville and lots of smaller towns.—*Phila. Times.*

North Carolina.—Mr. C. M. McNett, agent of the Thomson-Houston Electric Company of Boston, has effected sale of the apparatus for a fifty-light plant to the Durham Electric Lighting Co. (Thomson-Houston system), recently organized in Durham, and incorporated under the laws of North Carolina, with the following officers: J. S. Carr, President; W. Duke, Vice-President; G. W. Watts, Secretary and Treasurer. Directors: W. T. Blackwell; E. J. Parrish, Eugene Morehead, J. S. Carr, G. W. Watts, B. N. Duke, J. W. Blackwell and W. Duke. The machinery has been ordered and the work of construction will begin at once. This is the third city in this State to adopt the Thomson-Houston system within the past three months.

Secondary Batteries in Hull, Eng.—The first attempt at storage of electrical energy in Hull has been most singularly successful, and has taken place at the offices of Messrs. Thomas Wilson, Sons & Co. About a year ago these offices were lighted by electricity, the number of lamps spread over the extensive premises being 130. The dynamo machine was driven by a gas engine, but it was found that the explosions of gas which drove the engine rendered the light somewhat unsteady. Ultimately to obviate this defect, it was decided to employ a set of accumulators, and the contract for this work was given to Messrs. Paterson & Cooper, who have put in a set of fifty-two of Joel's accumulators; these consist of plates made up of matted lead fibre, separated by cocoa-nut matting, and immersed in boxes filled with sulphuric acid and water. The combined cells are adequate to supply the whole 130 lamps for five hours.

PERSONALS.

Mr. S. P. Freir, the expert of the Wheatstone automatic system of the Western Union Telegraph Company, was presented on New Year's day by the ladies employed under the system, with a silver fruit basket and bowl.

Mr. William Hammer.—The papers have been full of picturesque accounts of the remarkable "electric supper" given by Mr. Hammer, of the Edison Company, to his friends on New Years Eve. Everything was in "circuit," from the front door to the piano, and from the chairs to the coffee and confectioneries. The guests went home "with a bewildered feeling that somehow they had been living half a century ahead of the new year."

APPLICATIONS OF POWER.

Winthrop, Mass.—An adjourned town meeting of Winthrop citizens to finish up the business in the town warrant was held in the Town Hall last week. After calling the meeting to order, Moderator David Floyd, 2d, announced the committee to appear before the Legislature, and with the selectmen advocate the granting of a charter to the Enos Elevated Electric Railroad Company, as follows: Warren Belcher, E. S. Reed, S. A. Freeman and L. A. Wallen.

In Favor of the Electric Road.—The upper house committee on parks and ordinances has concluded to report in favor of granting a franchise for the Belle Isle electric railway on condition that its projectors file a $10,000 bond to commence work within three months after the park commissioners lay out a route, and to have the road in running order in two years. The committee adjourned pending the filing of the bond. The park commissioners and several projectors of the road appeared before the committee.—*Detroit Post and Tribune.*

Reckenzaun's Electrical Tram Cars.—A fortnight ago Mr. Reckenzaun's system of tram car propulsion was officially tried under the auspices of the Grosse Berliner Pferdebahn Gesellschaft, the Berlin police authorities, and other officials concerned in the administration of public safety and convenience, the inventor being also present. No private trials were allowed previous to this inspection, because the car could only be run in the public thoroughfares. Moreover, the worst portion of the line was selected for the trial, there being to start with curves of 33 feet radius, a long incline, and the rails blocked with snow and ice. The car was filled with the above mentioned officials, and started upon its journey amidst a great crowd, which soon collected. Not the slightest hitch, we understand, occurred during the whole trip, the car being stopped, started, and the speed varied at the command of the chief tramway inspector, the trial giving entire satisfaction to all present. The accumulators used in the car are charged from the central electric lighting station in the Ausstellungs Park, by a "Victoria" dynamo, at a distance of about a quarter of a mile from the starting shed. The same machine is used at night for illuminating some of the buildings in the park.

MISCELLANEOUS NOTES.

In Memory of Franklin.—The annual dinner of the Typothetæ, the master printers, will be given at Delmonico's on the evening of Jan. 18, the anniversary of Franklin's birthday.

The New Yacht "Eureka."—Mr. Secor's yacht "Eureka" is still lying at the yard of her builders, foot of Bridge street, Brooklyn, and is nearly ready for a trial of her machinery. Her boiler and tanks have been filled. Young Mr Secor says that he expects to have her ready for her trial trip very soon.

Societe Belge d'Electriciens.—At the annual meeting of this society, M. Delarge, Chief Engineer and Superintendent of Telegraphs, was unanimously elected president, *vice* M. Rousseau. M. Ch. Mourlon read the secretary's report, which showed the society to be in a flourishing condition, there being now 253 members. The publications of the society are always interesting and valuable.

German Cables.—It is well known that of recent years Germany has been busy in putting long lengths of her telegraph wire underground. The type of cable usually used is a seven strand copper, each insulated with gutta percha. The copper weighs 90 pounds to the mile, the gutta percha 76 pounds. The insulated wires are protected with 24 galvanized iron wires, weighing about 4,080 pounds per mile, over which is a serving of jute soaked in bituminous compounds. The cable, as a whole, weighs about 6,100 pounds per mile, and has a breaking strain of 4.5 tons. The cables are mostly buried without other protection.

Pure Carbon.—M. Jacquelain has endeavored to procure a pure carbon for electrical purposes that should be as hard and as conductive as gas carbon. He first takes gas carbon, which he submits to four processes: (1) Treatment with dry chlorine at a red heat for thirty hours; (2) treatment with hot alkali for about three hours; (3) immersion in hydrofluoric acid—one to two of water—at a temperature of 15° to 25°; (4) carbonization by heating strongly in the vapor of a high boiling hydro-carbon—for commercial purposes gas tar will do well. All these operations may be performed after the carbon has been cut into sticks.

Influence of Magnetization on the Conductivity of Magnetic Liquids.—Former experiments on the influence of magnetization on the resistance of magnetic liquids have led to negative results. An account, however, has been given of an investigation on the effect produced by the magnetization of ferrous sulphate as regards its electric conductivity. It would appear, so far as the experiments permit of a conclusion, that if the lines of the magnetic field are normal to the direction of the electric current, no effect is produced; but if the two are parallel to

one another, the electric conductivity is increased, and eventually the E. M. F. of the polarization of the liquid appears to be diminished.

A Question of Politics.—The *Pall Mall Gazette* recently had the following: "There are few who will watch with more anxiety the solution of the political problem than those who are interested in electric lighting. Mr. Chamberlain's act practically put an extinguisher upon the development of that industry by its stringent compulsory purchase clause. That act has to be amended in the coming session. Electricians would like to be placed upon the same footing as gas companies, free from the threat of compulsory purchase, but they are not likely to get those terms from either party. Lord Salisbury, however, has let drop certain words of encouragement tending to show that he is in favor of affording much more encouragement to the new industry than it has ever yet received. Hence, if the Conservatives retain power, the development of the electric light may enter upon a new lease of life. Such is the hope of many electricians."

The Electric Organ in Animals.—Prof. Du Bois-Reymond, according to *Nature*, has recently availed himself of good opportunities for examining the electric ray in the live state; and among several important facts elicited by him is that of irreciprocity of conduction in the electric organ. That is, when short currents are passed through the organ in the same direction as that of the animal's proper current, viz., from belly to back, and in the reverse direction, the conductivity in the former case is considerably greater. This irreciprocity begins to appear only when the current has acquired a certain strength; it increases with the strength, but more slowly. Both this irreciprocity and the small conductivity of the organ (which is considerably less than that of sea water) are proved to be connected with the life of the animal; the former disappears and the latter increases in the case of spontaneous death. The former depends also on the duration of the current, diminishing with a continuous current. This phenomenon of irreciprocity appears to have the effect of strengthening the animal's current and so intensifying its physiological action in external space. The author's researches on the subject have been recently laid before the Berlin Academy (*Sitzungsberichte*, Berlin Academy, 1885, p. 691).

SPARKS AND FLASHES.

Poles Worse than Wires.—The best thing they can do in Detroit would be to put the Poles under ground.

Sometimes Dazzling.—It is quite appropriate to speak of an electric light company as an example of brilliant management.

Freckles can be removed from the face by electricity. Positively the sun has nothing left to shine for—except two cents.—*N. Y. Star.*

BUSINESS NOTICES.

[Copy.]

W. H. GESNER, SUP'T.

OFFICE OF
THE BRUSH ELECTRIC LIGHT AND POWER CO.,
MONTGOMERY, Ala., Nov. 17, 1885.

Messrs. Giles, Bro. & Co., State and Washington Streets, Chicago, Ill.

DEAR SIRS: I have to acknowledge receipt of my watch with magnetic shield. Please accept my thanks.

I have given the watch a thorough test—held it all about the field magnets of a No. 8 Brush machine, running at 750 rev. per minute and supplying 52 arc lamps, without visible effect.

I consider your magnetic shield a perfect protection from magnetism.

I have ruined three or four watches heretofore, and have spent money enough for repairs to buy a dozen shields almost.

Very truly yours,
W. H. GESNER, Sup't.

The American Electrical Works, of Providence, have always displayed great taste in their stationery, and some of their special cards and calendars have been very beautiful. We are now in receipt of their dainty calendar for 1886, 11 × 14 inches, on heavy cardboard. The engraved design shows a girl "in maiden meditation, fancy free," lying on a summer slope, with book and sunshade beside her. The expression on the face is charming, its effect being gained partly by a nose "tip-tilted like the petal of a flower," as Tennyson felicitously puts it. Each of the date slips has also a neat and quaint design.

German Corn Remover
Kills corns and bunions, unfailing, rapid, painless; 25c.
HILL'S HAIR AND WHISKER DYE, black and brown; 50c.
PIKE'S TOOTHACHE DROPS will cure in one minute; 25c.
DEAN'S RHEUMATIC PILLS are a prompt, sure cure; 50c.
HALE'S HONEY, the great cough cure; 25c., 50c. and $1.
GLENN'S SULPHUR SOAP heals and beautifies the skin; 25c.

STOCK QUOTATIONS.

Telegraph, telephone and electric light quotations on the New York Stock Exchange, Boston Exchange and elsewhere are as follows:

Telegraph.—Am. Dist., b 30, a 31; B. & M., b 3, a 4; Western Union, b 74⅛, a 74⅞.

Telephone.—Am. Bell, b 169, a 169½; Erie, b 31, a 31¼; New England, a 30¼; Tropical, b 1.

Electric Light.—No new quotations.

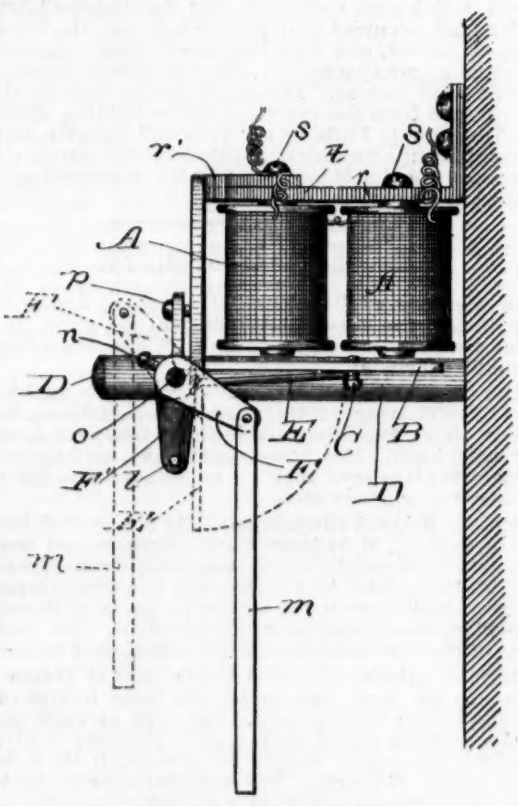
OUR ILLUSTRATED RECORD OF ELECTRICAL PATENTS.

PATENTS DATED DECEMBER 22, 1885.

332,721. Electric Arc Lamp Cut-Out; Osborn P. Loomis & Henry W. Cooley, Lynn, Mass. To the operating lever shown in their patent 324,778, Aug. 18, 1885, is attached an adjustable lever and contact points, which become included in the main circuit under abnormal conditions.

332,761. Electric Circuit; Robert R. Taylor, Washington, D. C. Consists of a conduit having an open back, the curb forming the back thereof, and means for securing the conduit and curb together, consisting of a projection or flange resting upon the top of the curb, and screws passing through the same into the curb.

332,832. Electric Meter; John S. Raworth, Manchester, Assignor to Siemens Bros. & Co. (Limited), Westminster, England. Relates to an electric meter, for

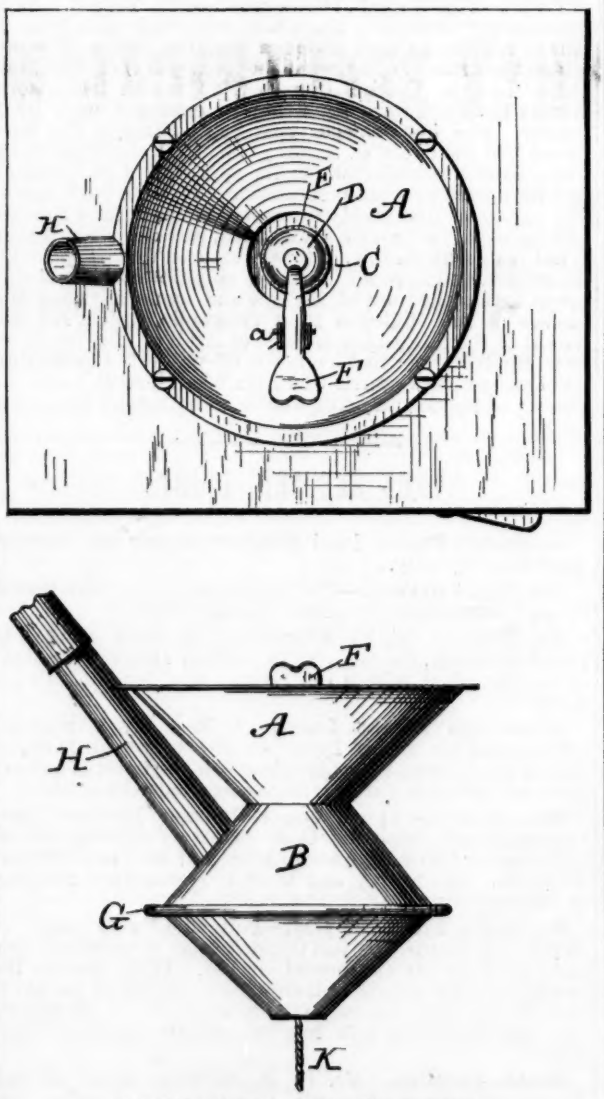


333,063.—ANNUNCIATOR.

measuring the electric current in a circuit, in which case it may be termed an "electro-dynamometer," or, with suitable modifications, for measuring the electro-motive force, in which case it may be called a "volt-meter." For both purposes the principles of action are the same, but the construction is so far modified as to suit two different conditions, the chief modification being in the character of the coils employed. In the one case, for the electro-dynamometer, a coil-conductor of large sectional area and very low resistance is used; in the other case, for the volt-meter, coils of fine wire and very high resistance are used. Consists of details as follows: A spindle, having two small arms projecting from it in opposite directions; conducting-coils, consisting of numerous convolutions of fine insulated wire arranged around the spindle, the rectangular casing having a number of convolutions of insulated wire wound around it, the index-wire counterbalanced by an adjustable weight, and projecting through the dial, the central spindle passing through the dial, and the volute spring connected by the arm to the index wire.

332,845. Pole Changer; Eliphalet W. Smith, Newark, N. J. Consists, as shown in the cut, of mechanism which in its operation actuates other mechanism by which the currents from the electrodes are alternately permitted to pass over the line-wire to the ringing apparatus or to any other desired point.

332,926, 332,927, 332,928, 332,929. Electrical Railway and Conduits; James F. McLauchlin, Philadelphia, Assignor by mesne assignments to the National Electrical Railway System (Limited), same place. 1. Consists of a rail carrying insulated conductors on its opposite sides, with an electrical railway car having two levers pivoted to the car and carrying at their lower ends contacts for the said conductors and at their upper ends



333,044.—MECHANICAL TELEPHONE.

spring-pawls and curved racks on the car, with which the pawls engage.

2. Consist of slight improvement in shape of an electrical conduit.

3. Consists of stringers and rails with L-shaped bars carrying the conductors, and forming, with the said stringers and rails, conduits therefor, and cross-ties carrying both stringers and bars.

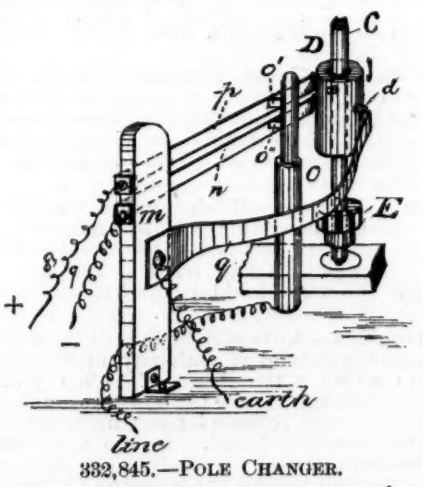
4. The method consists in intermitting the current in the derived circuits between the line conductors, some of the motors being thrown out of circuit while others are in circuit.

332,971. Electric Arc Lamp; William M. Thomas, Grand Rapids, Mich., assignor of one-half to Grand Rapids Electric Light and Power Co., of same place. It is an improvement upon his patent 278,293, May 22, 1883.

333,008. Electro-Magnetic Reversing and Steering Mechanism for Torpedo-Boats; Horace P. Griswold, Providence, R. I. Consists of a continuously revolving shaft having a screw-worm secured thereto, one end of which (the shaft) being mounted in an arm or bearing, which is adapted to be vibrated laterally by means of an electric current passing through an electro-magnet, in combination with two toothed wheels or sectors, the angular movement of the latter being transmitted to an arm or tiller secured to the rudder-post, whereby the boat is steered right or left, according as the said worm engages its corresponding toothed wheel, the worm being disengaged from both wheels when the boat is running in its true or "steady" course.

333,014. Telephone Annunciator; James Houlehan, Toledo, O., Assignor of one-half to William A. Bunton, Boston, Mass., and seven-sixteenths to J. S. Baker and E. E. Dwight, Toledo, O. Its especial object is to put rooms of a hotel into communication with the hotel and central offices. The improvements relate to minor details.

333,028. Globe for Incandescent Lamps; William Stanley, Jr., Pittsburgh, Pa. The bulb is of blown glass,



332,845.—POLE CHANGER.

and the neck, having the leading in wires passing through the same, is of molded or pressed glass, the joint between the two forming a ridge for holding the lamp in its socket.

333,044. Mechanical Telephone; Messrs. B. Williamson, Xenia, Ill. The construction is shown in the cuts, and its operation is like that of other mechanical telephones.

333,063. Annunciator; Delavan S. Foote, Chicago, Ill., Assignor to the American Electric Manufacturing Co., same place. Consists, as shown in the cut, in providing an electro-magnet having an armature pivoted toward one extremity to lie below the electro-magnet, and provided with a catch, and a drop or curtain having means for raising it and hinged below the armature toward one end of the same, to afford, to the drop or curtain, a swinging motion, whereby, when the free end of the drop or curtain shall be raised to a horizontal or nearly horizontal position, it shall be engaged by the catch on the armature and held by the weight of the latter, and released by the attraction of the armature to the electro-magnet and be allowed to fall by its own gravity.

333,079. Measuring Electric Currents; Samuel D. Mott, New York, N. Y., Assignor, by mesne assignments, to the Schuyler Electric Light Co. Consists of an improvement upon an invention shown in his patent, 267,445, Nov. 14, 1882.

Copies of the specifications and drawings complete of any of the patents mentioned in this record—or of any other patent issued since 1866*—can be had from this office for* 25 *cents. Please give date and number of patent desired, and address Johnston's Patent Agency,* 9 *Murray st., New York.*